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ONTARIO
AGRICULTURAL COMMISSION.

REPORT

OF THE

COMMISSIONERS.



Toronto:

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ONTARIO AGRICULTURAL COMMISSION.

REPORT OF THE COMMISSIONERS.

To the Honourable JOHN BEVERLEY ROBINSON,

Lieutenant-Governor of Ontario.

SIR,—The undersigned Commissioners, appointed under the authority of an Order in Council passed on the 3rd day of April, 1880, have the honour to report as follows:—

CHAPTER I.

Origin and Proceedings of the Commission.

The appointment of a Commission “to inquire into the Agricultural resources of the Province of Ontario, the progress and condition of Agriculture therein, and matters connected therewith,” was first suggested in the Report of the Commissioner of Agriculture to His Honour the Lieutenant-Governor, for the year 1879. The Commissioner, at considerable length, set forth the objects to be attained by the step he recommended, and the precedents supplied by the parliamentary history of Great Britain and Canada for such an investigation.

The views expressed in the Commissioner’s Report were subsequently embodied in a recommendation to Council, on which recommendation the Order in Council was issued, as already stated.

In the recommendation to Council above referred to, the Commissioner suggested the following subjects as those to which the members of the proposed Commission should be more particularly invited to address themselves:

1. The soil, climate, topographical features, cultivable area, and products, of the several sections of the Province.
2. The progress and condition of husbandry in Ontario.

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3. Grain-growing in its several agricultural and economical aspects.
 4. Stock-raising do. do. do.
 5. Dairying do. do. do.
 6. Fruit-growing do. do. do.
 7. Bee-keeping.
 8. Forestry.
 9. Cultivation of special crops, such as flax, etc.
 10. Drainage.
 11. Manures—natural and artificial.
 12. Insects and insectivorous birds.
 13. Employment of labour, and labour-saving appliances.
 14. The ownership system as compared with renting.
 15. Stock laws.
 16. Fencing.
 17. Agricultural book-keeping.
 18. Agricultural education.
 19. Agricultural Societies; Grants and Shows.
 20. Agricultural statistics.
 21. Functions of the Bureau of Agriculture.

The first meeting of the Commissioners, for the transaction of business, took place at Toronto, on the 14th day of April, 1880.

In order to systematize the work to be performed, and to secure a due division of labour, it was resolved to classify the subjects of inquiry under the following heads, seven in number, and to charge certain of the Commissioners, specially, with the duty of inquiring thereinto.

No. 1.

The Soil, Climate, Topographical Features, Cultivable Area and Products of the several sections of the Province, and the Progress and Condition of Husbandry in Ontario.

No. 2.

Grain Growing in its several Agricultural and Economical aspects; Drainage and Manures, and the Recuperation of Impoverished Lands.

No. 3.

Stock Raising, Dairying, Stock Laws and Fencing.

No. 4.

Fruit Growing, Forestry, Insects and Insectivorous Birds, and Bee-keeping.

No. 5.

Cultivation of Special Crops, such as Flax, etc.

No. 6.

Labour and Labour-saving Appliances, Ownership of land as compared with Renting, Agricultural Book-Keeping and Agricultural Education.

No. 7.

Agricultural Associations, Grants and Shows, and Functions of the Bureau of Agriculture.

At the same time it was determined to prepare lists of questions under the several heads, either to be forwarded to persons or corporations, or for the guidance of the Commissioners in the oral examination of witnesses.

This plan was found to be a most advantageous one; it not only assisted the Commissioners to obtain a large amount of information which would otherwise have been beyond their reach, but it enabled them to advise witnesses, in advance, of the line of inquiry to be followed. It had also the effect of classifying the evidence, oral and documentary, of reducing it to a convenient form, and consequently of rendering it more intelligible and more easily accessible to the public.

Meetings for the transaction of business were subsequently held on the 15th April, 9th June, 22nd June, and 27th October, 1880, respectively.

Full reports of the Commissioners' proceedings, from time to time, will be found in Appendix A, and it will be necessary therefore to give only an outline of them in this place.

The first action taken under the arrangements above described was, the issuing to every township in the Province, addressed to the respective Reeves and Township Clerks, a series of questions relating to matters specially entrusted to the Commissioners of Section One, the persons addressed being invited to call a meeting of the Council, at which the attendance of the township officers and other leading ratepayers should be requested, for the purpose of considering the questions and preparing answers. This course was very generally adopted, and while it is evident that the information obtained in this informal manner, cannot be so accurate, in a purely statistical sense, as returns compiled by officers paid for devoting their time to a close inquiry into every detail, the Commissioners believe that it is as a whole reliable, and as accurate as its nature would permit.

These returns have been tabulated and arranged in county groups, and, with carefully compiled summaries and county maps, form the contents of Appendix B. Although the duties assigned to the township officers and others above mentioned have entailed no small sacrifice of time and labour, without pecuniary remuneration, at a season of the year when agriculturists are most busy, the Commissioners have the great satisfaction of reporting, that out of the whole Township Municipalities of the Province, only two are unrepresented in the published returns.

Concurrently with the action of the Commissioners of Section One, their col-

leagues proceeded with other branches of the inquiry, which embraced the following subjects (*See Appendices C—Q*):—

Fruit Growing, Forestry and Arboriculture.

Grape Culture, and the Manufacture of Wine from the Native Fruit.

Insects and Insectivorous Birds.

Bee Farming.

General Farming, including the Management of Crops and Stock, Draining and Manuring.

The comparative merits of the several varieties of Cattle, Sheep, and Hogs; the demand for Native Wool; Hog-raising and Pork-packing.

Dairying, including Cheese and Butter making, and the establishment of Factories and Creameries.

The Feeding and Grazing of Cattle, and the Cattle Shipping trade.

Horse-breeding.

Poultry and Eggs.

Salt in relation to Agriculture and cognate industries.

Gypsum, Phosphates, and other special Fertilizers.

Cultivation of Flax, and other special crops.

Agricultural Education; and

Meteorology in relation to Agriculture.

The information on the foregoing topics was partially obtained by circulars, addressed to leading representatives of the agricultural and fruit-growing interests in various parts of the Province, but principally by the oral examination at Toronto and elsewhere of competent witnesses.

In a few instances, these investigations were conducted by the Commissioners of the respective sections, but, more frequently, by two or three Commissioners only, selected with a view to personal convenience and economy, and their special acquaintance with the subject in hand.

It became evident at a very early period of the Commissioners' proceedings, that it would be most satisfactory, and at the same time save a large expenditure, if sittings were held at different points in the Province, instead of summoning a large number of witnesses to Toronto. This course was accordingly adopted, and visits were paid to the following places—Guelph, London, Chatham, Windsor and Sandwich, Walkerville, Seaforth, Teeswater, Fergus, Galt, Perth, Almonte, Arnprior, Ottawa, Prescott, Belleville, Cobourg, and Bowmanville. At some of these places no formal sitting was held, but much interesting information was obtained by a personal inspection of cheese factories, stock farms, horse-breeding establishments and vineyards.

The total number of witnesses examined in the course of these visits, and in Toronto was 155.

It was evident that, in an inquiry into the agriculture of Ontario, the condition and progress of agriculture in the more newly settled districts could not be overlooked, and for reasons which commended themselves to the judgment of the Commissioners, it was decided that three of their number should visit the Electoral District of Muskoka and Parry Sound, for the purposes of personal observation, and the examination of such witnesses as they might deem it advisable to call before them.

The Report of the three Commissioners, and the evidence of fifty persons examined by them in the District, will be found in Appendix R.

During the summer, Mr. Richard Gibson, a member of the Commission, having informed his colleagues of an intended visit to Great Britain, was requested by resolution, to report, on his return, upon any subjects bearing upon the interests of the Province, and cognate to the purposes of the Commission.

Mr. Gibson's report will be found in Appendix S.

Mr. Saunders, another member of the Commission, having occasion to spend some time in the Island of Manitoulin, was also invited to report the result of his observations on the agricultural resources of the island, and adjacent mainland settlements. Mr. Saunders' report will be found in Appendix S.

During a visit of some of the Commissioners to the Counties of Essex and Kent, Mr. Wm. McGregor, ex-M.P. for the latter county, gave evidence as to its resources generally. To this statement considerable additions were afterwards made by Mr. McGregor, and it was decided to throw the whole into the form of a report, which is also included in Appendix S.

More recently, Mr. E. H. Hilborn, a member of the Commission, having visited Washington and inspected the operations of the Agricultural Bureau of the United States, and also obtained some valuable information regarding the introduction of agricultural education into the Public Schools of the State of Tennessee, has contributed a report, which will be found with others in the last named Appendix.

In addition to the large fund of materials thus collected, the Commission have received a valuable letter on Forestry and Arboriculture, from the Honourable Senator Allan; a paper on Practical Dairy Farming, from Mr. Francis Malcolm, one of their number; additional evidence, from Mr. Wiser, M.P., another Commissioner, on Distillery Cattle Feeding statements obtained by Mr. Edward Byrne, another Commissioner, respecting Private Cheese Factories in the County of Leeds, and several other items, of which not the least interesting are letters, statements, and printed matter relating to the Holstein and Polled Angus breeds of cattle, contributed by persons in the United States, and a paper on the Various Breeds of Sheep, by Professor Brown, also a member of the Commission. All these will be found in the evidence under their respective heads.

Inquiries have been instituted by circulars, addressed to qualified Veterinary Surgeons throughout the Province, as to the diseases, or freedom from diseases, of farm stock in Ontario.

The operation of Stock or Herd Laws in Ontario and several States of the Union, for restraining cattle and farm stock generally from running at large, has been the subject of inquiry and correspondence.

Reports on both the last above-named matters have been prepared, and will be noticed in due course.

It will be sufficiently clear from the above, that the Commissioners have kept closely in view the importance of confining their attention to matters of a strictly practical nature. Many important questions—more or less closely relating to the interests of agriculture and the agriculturist—have presented themselves in the course of the inquiry, but, desiring to give effect to the view expressed by the Commissioner of Agriculture, in his recommendation to Council, of April last, that their labours should be brought to an end in time to allow of a report being laid before the Legislative Assembly during the forthcoming Session, the Commissioners have resisted the inducements to travel over a wider field of investigation than was outlined in the original programme.

They have, in fact, been compelled, with great reluctance, to leave untouched some matters which they had hoped to have found an opportunity to deal with as they deserved.

Among the latter may be mentioned, the employment of labour and labour-saving appliances on farms; and the comparative merits of the system of land ownership generally existing in this Province with that of leasing or renting farms, more particularly in the cases of small capitalists, and the holders of encumbered farm properties.

The subjects of Agricultural Associations and Shows, and the Grants made annually by the Legislature in support thereof, were remitted for consideration to one of the Sections; but the Commissioners of that Section have been constrained to report to their colleagues—who fully endorse the opinion expressed—that, while there is, undoubtedly, at the present time a very considerable feeling in the public mind in favour of some alterations and modifications of the present system, no radical change should be made without the most careful inquiry and the utmost deliberation. Recognising fully, however, all that time and altered circumstances have effected in this regard, the Commissioners respectfully recommend that this matter should be considered by the Government at no distant day. They believe that full information respecting the work done, and the method of conducting many of the present Associations and Shows, would indicate some rearrangement to be called for in the public interest. And such information, it is submitted, might be obtained either under the powers of the Agriculture and Arts Act or by other agency, with little difficulty and at small cost. It is with much regret the Commissioners find, that other claims upon their time and attention have prevented them from even attempting to do justice to this important subject.

In his recommendation to Council, before mentioned, the Commissioner of Agriculture gave considerable prominence to the suggestion that the Commis-

sioners should report upon the functions of the Bureau of Agriculture, with a view to its re-organization. In this connection the subject of Agricultural Statistics would have held a foremost place.

It can hardly be doubted but that an enlargement of the powers and functions of the Bureau would be very desirable, in order that a more active supervision should be exercised over the applications of the public money voted for the encouragement and advancement of agriculture, and that the Department of Agriculture should be more closely identified with the great agricultural interests of the Province than, with its present limited machinery, is possible. But, for reasons already set forth, the Commissioners feel unable to do more at the present time than advise, that the subject should receive the early attention of the Government and Legislature, and to state that, in the event of such a re-organization of the Bureau as is suggested, the Commissioners would view with much pleasure any well-considered scheme for utilizing the experience and information of practical agriculturalists, in an advisory sense, in connection with the operations of the Bureau.

The Commissioners are desirous of expressing their high appreciation of the prompt and ready responses they have received from the different persons and corporations to whom requests for information and assistance have been, from time to time, forwarded. They have also to acknowledge the courtesy shown them by representatives of the Government of the United States, and of the State Governments, as well as by many private citizens of that country to whom applications on their behalf for documentary and other information have been made; and they may here take the opportunity of remarking that, in their opinion, great advantage would result from a more frequent interchange of correspondence between the Ontario Bureau of Agriculture, and the American Bureaux and State Boards of Agriculture, the operations of which are evidently carried on, in many instances, with great intelligence, energy and success. In the event of the Ontario Bureau being reorganized, the experience of such or similar institutions in the United States would be found to be most useful.

In collecting, compiling and arranging the evidence, as well as in preparing their present report, the leading motive of the Commissioners has been to make the whole as useful as possible to those for whom the contents of the Report and its appendices are chiefly designed, and thus to produce a volume of practical information for the farmers of Ontario.

The evidence was taken in shorthand, by Messrs. Albert Horton and George Eyvel, members of the reporting staff of the House of Commons, and transcribed by them in a narrative form. It has since been so classified as to group together, as far as possible, the reports relating to each subject under one head, and subdivided with appropriate captions so as to make reference to any part as easy as possible. Each appendix will, in fact, be an independent pamphlet, which may be distributed either separately or in company with others.

The report that the Commissioners have the honour to present has been written in such a manner as to reproduce in a convenient shape the salient points of the voluminous materials collected together, and published in the form of appendices; and, while it varies considerably from the usual form of official documents, its usefulness will, the Commissioners hope, by that means be increased.

They have adopted in their report a narrative, in preference to a didactic style, desiring not so much to give utterance to their own opinions as to communicate fairly the views and experience of those whose statements they have had before them.

All the proceedings of the Commissioners, whether at meetings for deliberation, or for the examination of witnesses, have been open, and usually attended by representatives of the press, who have also had access to any documents and statements in the possession of the Commissioners. To this, the Commissioners believe, is largely due the public interest in the Commission, and the friendly spirit in which its labours have from time to time been noticed. The examinations of witnesses have been conducted in as informal and conversational a manner as was consistent with good order, and the despatch of business.

With these observations the Commissioners will now address themselves to a review of the evidence, making, as they proceed, such comments as the facts seem to demand.

CHAPTER II.

FRUIT CULTURE.

Fruit Growing Capacity of Ontario.

“As a Province, I should say we are able to grow any fruits that are grown in the temperate zone.” That short sentence, extracted from the evidence of Mr. D. W. Beadle, one of the most eminent pomologists of this continent, briefly, but comprehensively, describes the fruit growing capacity of the Province of Ontario. One district or section may be more favourable to fruit production than another; in some, certain descriptions of fruits cannot be so profitably cultivated as elsewhere; in others the intelligent culturist makes his selection between different varieties, but—these distinctions admitted—it can be broadly and confidently asserted that, in the area comprised within the scope of the Commissioners’ investigations, there is no fruit known to temperate climes that may not, somewhere or other, find sure and profitable cultivation.

The Area Embraced in the Evidence.

Starting from the Niagara River, the testimony, oral and documentary, under this head, represents the Niagara District, the Lake Erie counties of Norfolk and Elgin; the peninsula lying between Lakes Erie and St. Clair; the Lake Huron and Georgian Bay region; the inland counties of the south-western peninsula; the district of which Toronto may be regarded as the centre; the range of counties lying between Toronto and the eastern boundary line; the inland northern district around Lindsay and Peterborough; the Ottawa valley from Arnprior to the City of Ottawa; and the new outlying regions of Muskoka and Manitoulin. It will be desirable, in the first instance, to recapitulate briefly the statements in which the fruit growing capacity of the several sections above named are referred to by witnesses, or in reports forwarded to the Commissioners.

The Fruits of the Niagara District.

Mr. Beadle says:—

“I represent here to-day what is known as the Niagara District. I suppose it embraces the peninsula between the two lakes, from Hamilton to the river, but more particularly the area lying below the mountain. I have had opportunities

of familiarizing myself with the fruit-growing capabilities of that district, and the character of the fruits grown in it.

"The class of fruits that has particularly claimed my attention is that embracing those which are readily cultivated in our district, such as apples, plums, pears, cherries, peaches,—in fact all those that are cultivated in our climate, or all those that flourish in the temperate zone. In addition to those named I may mention grapes, strawberries, currants, raspberries, etc."

The Fruits of the Counties of Norfolk and Elgin.

Travelling westward along the Lake Erie coast line, we have from the County of Norfolk :—

"The fruits cultivated in this county are: apples, pears, peaches, cherries, plums, grapes, currants, strawberries, raspberries, gooseberries, quinces, and blackberries."

And from Elgin :—

"Apples, pears, peaches, cherries, strawberries, grapes, raspberries, blackberries, gooseberries, and a few plums and currants are the fruits cultivated in this district."

The Fruits of Kent, Essex and Lambton.

The Counties of Essex and Kent in many parts present the appearance of a vast fruit garden.

Mr. Mackenzie Ross, whose fruit and nursery grounds are situated in the Township of Harwich (Kent), just beyond the municipal limits of the Town of Chatham, says, in his evidence :—

"The soil and temperature of the County of Kent cannot be surpassed for fruit growing."

And Mr. Westland, from Ridgetown, Township of Howard—also in Kent—says :—

"We can grow in our township all the fruits that can be grown in a temperate climate."

Mr. Dougall, for twenty-eight years a nurseryman at Windsor, in Essex, says of the portion of that county skirting the shores of Lake Erie and the Detroit River :—

"That region is adapted to the growth of every kind of fruit that can be grown in the temperate zone."

Turning northward, the report from Lambton is :—

"Apples, pears, plums, cherries, grapes, currants and melons, are cultivated in this district."

The Fruits of the Huron District.

Striking next the coast line of Lake Huron, and turning to the evidence of Mr. McD. Allan, of Goderich, we find him saying :—

"In our district we cultivate apples, pears, plums, peaches, cherries, grapes, nectarines, apricots, quinces, currants, raspberries, strawberries and gooseberries."

By our district I mean the County of Huron, though a good deal of what I have to say will apply to parts of Perth and Bruce. There are about 6,540 acres under orchard and garden in the county. In apples, 4,870; plums, 330; pears, nearly 90; peaches, about 52. We have about 50 acres of strawberries, nearly 100 of grapes, and about 80 acres of other small fruits. . . . The estimated quantity of apples produced in our county in 1879, was 435,000 barrels."

The Fruits of the Owen Sound District.

Then calling on Mr. Roy, the witness from Owen Sound, we read:—

"Almost every description of fruit succeeds well in our district. I regard it as the very best fruit growing section. I refer to the district from Sarnia to Collingwood, along the shore of Lake Huron and the Georgian Bay."

The Fruits of Perth, Middlesex and Oxford Counties.

Coming next to the western inland counties, we have from Perth:—

"Apples, pears, plums, cherries, grapes, currants, gooseberries, peaches (a few), strawberries and raspberries, are the fruits cultivated in this district. About 75 per cent. are apples, 10 per cent. plums, and about 3 per cent. peaches."

From Middlesex:—

"The varieties of fruit grown in the above county include all kinds grown in Ontario, with the exception of peaches, apricots, nectarines and quinces. The district being one of the most favoured in the Province, the yield is very abundant."

From Oxford:—

"Apples, peaches, plums, pears, quinces, cherries, small fruits of all kinds, and grapes in small quantities, are the fruits that are grown in this locality."

The Fruits of the Brant District.

From the County of Brant the testimony of Mr. Charles Arnold, of Paris, is:—

"All the ordinary fruits that have been named are grown in the district that I represent, though peaches are grown on a small scale, and some varieties of cherries and blackberries have not been a success."

Not forgetting the great fruit growing industry, including grapes, apples pears and strawberries, in the Counties of Wentworth and Halton, we come next to the Toronto District.

The Fruits of the Toronto District—Favoured Sections.

Taking more than a local view of the subject, Mr. George Leslie, Jr., the well-known nurseryman and fruit culturist of Toronto, says:—

"There seems to be a line drawn right through the Province; wherever you get the water on the north side, even a great deal north of this, you get a good fruit growing country. At Owen Sound, for instance, where the water is on the north side, they have a very good fruit section, and can even grow apricots and nectarines, which we in Toronto cannot grow. Generally speaking, good fruit growing sections are in the vicinity of large bodies of water; the shores of the

St. Lawrence are well adapted to fruit raising, and we have a very good country at Toronto, though we cannot successfully cultivate peaches, apricots, nectarines, or blackberries."

The language employed by Mr. Leslie is used of course in a comparative sense. He probably intends to imply, that in the most favourable sections, all fruits, or nearly all, can be profitably grown, while some others—Toronto for instance—although on the whole good fruit growing districts, must be content to cultivate all but the more delicate fruits. His suggestion of an imaginary line dividing the Province does not, however, quite correctly describe the actual geographical facts. The best fruit growing sections have water, not on the north side alone, but are distinctly peninsular in their character. A glance at the map will show that the Niagara district is a peninsula washed on its shores by the waters respectively of Lakes Ontario and Erie. The chief fruit lands of south-western Ontario, are found in a peninsula jutting out between the waters of Lakes Huron and St. Clair and Lake Erie, while the Saugeen peninsula is the popular designation of the famed fruit district embracing Owen Sound, on its northern, or Georgian Bay, and Goderich, on its western coast line.

The Fruits of Durham and Northumberland.

Tracing our course from Toronto, along the north shore of Lake Ontario, we have, from Mr. Chaplin, of Newcastle, in the County of Durham, and Mr. Hinman, from Grafton, in the County of Northumberland, evidence in effect, very similar to that given by Mr. Leslie.

The Fruits of the Bay of Quinte District.

The Bay of Quinte District—extending from the County of Northumberland to the eastern extremity of Lake Ontario, and including Prince Edward County, another peninsula, all but surrounded by the waters of the bay and lake, and a choice fruit growing county—is represented in the evidence by Mr. Dempsey, who has fruit growing farms both in Prince Edward and Northumberland. Mr. Dempsey says:—

"I represent Lennox, Addington, Hastings, Northumberland and Prince Edward from the lake northwards, in the Fruit Growers' Association and Agricultural and Arts Association. I have been engaged in fruit culture about forty years, and as a business for the last twenty-five years. During that time I have had opportunities of becoming tolerably conversant with the fruits of the districts which I represent. We grow nearly all the small fruits, apples, pears, and plums. We grow very few cherries, and though there are few peach trees I could recommend peach culture there. Apples are the most important fruit crop we have. Probably about seventy-five per cent. of the whole area under fruit is devoted to apples, perhaps more. Not more than one-third of the apple trees in our district are in full bearing, probably about one-fourth. Fruit culture is extending rapidly throughout our district. There are a great many acres devoted to small fruits at the present time, principally strawberries."

The Fruits of Dundas, Stormont, and Glengarry.

Passing eastward from the Bay of Quinte along the north shore of the St. Lawrence, and away from the mellowing influence of the great lakes, we might expect to find a very material change in the fruit-growing capabilities of the country. But from the United Counties of Dundas, Stormont and Glengarry, lying within the angle formed by the St. Lawrence and Ottawa Rivers, in a very full report of their fruit products we read :—

“The fruits that are cultivated in this district are, apples, plums, cherries, grapes, strawberries, currants, gooseberries, cranberries, tomatoes, raspberries, blackberries, brambleberries, and melons.”

The only fruits missed from this very comprehensive list are the peach and the pear. The former, except perhaps in Prince Edward County, can hardly be said to be cultivated anywhere, in marketable quantities, on the northern side of Lake Ontario's waters. And of the pear we read further on :—

“Pears can be successfully cultivated to a limited extent. They have been cultivated as far east as Montreal; can be grown in sheltered situations on a dry subsoil, of excellent quality, but on a limited scale.”

The Fruits of the Ottawa District.

Following the course of the Ottawa River, we have from Mr. Bucke, at the City of Ottawa, the following evidence :—

“We cultivate a few varieties of apples, raspberries, strawberries and gooseberries, and small fruits generally, including grapes, are also cultivated.”

But the strength and weakness, in relation to fruit growing, of this particular district, will be more apparent when the cultivation of the several fruits comes to be discussed.

The Fruits of Renfrew County.

At Arnprior—still on the Ottawa, and where the most northerly point in eastern Ontario, from which evidence has been taken, is reached—the Renfrew Fruit and Floral Company are engaged in a gallant, and so far encouraging, enterprise. The measure of their success can only be properly appreciated by following up their operations in detail. But Mr. Osborne, their manager, is able to mention as free from all danger from climatic vicissitudes, some four or five varieties of apples, and to speak favourably of his progress with two or three descriptions of pears, with grapes, and with small fruits.

The Fruits of the Lindsay District.

Once more striking west we complete the circuit at the inland Town of Lindsay in Victoria, “where,” says Mr. Beall :—

“The Fruits cultivated are: apples, pears, plums, strawberries, raspberries, red, white and black currants, gooseberries and grapes.”

The Fruits of Muskoka and Manitoulin.

Finally we have reports from Commissioners visiting the new districts of Muskoka and the Island of Manitoulin.

With respect to Muskoka the three visiting Commissioners say:—

“With the exception of the grape the smaller fruits are indigenous to the District, all the berries abound in the woods, and the wild plum is also very plentiful, being cultivated by the settlers, and yielding a large crop of fruit valuable for economical purposes. In face of the abundant natural supply, the cultivation of berries is small; but the strawberry where planted, yields a very good return. For hardy plums it cannot be doubted that the conditions are favourable.”

They then refer to the successful growth and fruiting of some hardy varieties of apple, to the prolific yield of the crab, and to the successful efforts to grow and ripen grapes of the cultivated varieties.

Of the fruit growing capacity of the Island of Manitoulin, Mr. Saunders, after noting the existence of a number of thriving young orchards at various points says, that, at Manitowaning, he saw:—

“Several varieties of apples, fruiting fully . . . The Clinton grape was also fruiting well, while currants, raspberries, water melons, and nutmeg melons were grown successfully.”

Rapid progress of Fruit Industry.

The rapidity with which a large measure of success has been achieved in this branch of industry is a powerful testimony to the natural advantages of the Province as a fruit producing country. Fruit cultivation is necessarily among the later pursuits of the settler in a new region. Where every foot of ground has to be cleared of timber and brush-wood before the spade can enter in, it is the first necessities of life, not its luxuries, or quasi-luxuries, that have to be thought of. Many years often elapse before the ground can be spared and the time devoted to fruit cultivation, and an orchard, when planted, does not give fruit in a day. The Province of Ontario, as the representative of Upper Canada, is even now not ninety years old. Men are living who can remember, when, with the exception of a scattered settlement here and there, nearly the whole Province was an unbroken forest, and it is but within very few years indeed that the cultivation of fruit, except in the most primitive fashion, and for home consumption only, was first attempted. In the rapid progress made, no little credit is due to the exertions of the Society known as the Fruit Growers' Association.

Fruit Growers' Association of Ontario.

The Fruit Growers' Association of Ontario was organized in 1859, for the purpose of advancing the interests of fruit culture in the Province, and bringing together at certain intervals those engaged in this important branch of industry

for the purpose of interchanging their views and profiting by each other's experience. In 1863 the first report of the Society was published, containing statistics on fruit culture from most of the western counties, followed by a list of fruits which had been found to succeed in the different sections reported on. No further effort in this direction was made for want of funds until 1868, when the Association became incorporated under the Act for promoting agriculture, and was then entitled to receive a yearly grant of \$350 from the public funds. From this date the activity and usefulness of the Association was greatly increased, and its membership largely augmented from all parts of the Province, and it has ever since made a yearly report to the Commissioner of Agriculture, of its work, embodying much useful and practical information on fruit growing, which reports have formed a part of the Commissioner's annual report. In addition to the compilation of this most valuable annual document, a number of new varieties of fruit trees and vines have been disseminated among the members with the view of testing their hardiness, etc., in our climate, and from these tests much useful knowledge has been gained, and a great impetus given to the culture of fruits throughout the Province.

In 1873 a very extensive competitive international exhibit of fruits took place in Boston, Mass., when this Association made an exhibit of fruits from Ontario which astonished the people of the United States, and Ontario was awarded four silver medals, one bronze medal, and one hundred and twenty-five dollars in money, while at the same time the fruit growing resources of the Province were widely and extensively commented on by the press throughout the North American continent. In 1876, at the time of the great Centennial Exhibition in Philadelphia, the Fruit Growers' Association again rendered good service to the Province. By the united exertions of its officers and members, a continuous fruit exhibit was maintained in Philadelphia during the entire season, giving the visitors from all parts of the world an opportunity of examining our fruit products. On this occasion fifteen medals and awards were given to Ontario fruit, and these evidences of the favourable character of our climate were commented on the world over, greatly to the advantage of our Province. The Association having, within the past year, taken up the department of forestry also, a still wider sphere of usefulness is open to it. To its officers, and especially to its efficient Secretary, Mr. D. W. Beadle, who has held that office for eighteen years, great credit is due, and to their zeal in the interests of fruit growing, we are largely indebted for the present advanced condition of fruit culture in Ontario.

The Soil—the Climate—Indigenous Fruits.

Yet this useful, and most meritorious body of fruit culturists have only been assisting and giving effect to the inherent fruit producing vigour and sympathy of the soil and climate of a country to which nearly every fruit in its wild state

is indigenous. The apple, the plum, the cherry, all the nuts and the small fruits, are familiar objects to every one acquainted with our woodlands. It is from the native Fox and Frost grapes intermingled, and crossed with the European wine grapes, we have obtained the splendid variety of dessert and wine grapes we are now able to display. In one part of the Province, and only one—the District of Muskoka—is the wild vine known to be absent.

Success of Non-indigenous Fruits.

The ameliorating influence of the great lakes, the abundant but not too continuous rainfall, and the ample amount of sunshine, and corresponding heat, combine, not only to favour the growth of hardy fruits, but also to produce, without artificial assistance or protection, such fruits as the pear, the peach, the apricot, and nectarine, for marketable purposes, and, in the case of the two first named fruits, on the largest scale. In no country in the world does the pear attain greater perfection, and while the peach in the mild, but less certain, climate of Great Britain is a luxury, the very flavour of which is hardly known to the mass of the people, in Canada the humblest day labourer can purchase this luscious fruit by the basketful. The fruit growing capabilities of Ontario will be fully established when set forth in detail by the witnesses whose evidence is under review.

Statistics of Fruit Culture.

They would be established with absolute exactness if any machinery existed for collecting accurate statistics of the fruit products of Canada. The attention of the Fruit Growers' Association has been for some time directed to this subject, and it is satisfactory to observe, from the forms for the census returns which have been published, that the efforts of the Association have been to a large extent successful, so far as the forthcoming census is concerned. Mr. Beadle says:—

“I think no attempt has been made in taking the census to obtain statistics of the quantity of fruit produced. My impression is that no information is sought of the area of land under fruit culture. The Fruit Growers' Association have several times called the attention of the Dominion Government to the importance of obtaining these statistics. The President of our Association reported at a meeting held since the last exhibition in Ottawa, that he had had an interview with the Minister of Agriculture on the subject, and that he had assured him that steps would be taken towards securing such statistics in the next census enumeration. Though a decennial return would be of some value, it would be better to have them more frequently, and they would not be quite satisfactory unless they were made yearly. I think such statistics could be obtained, without much trouble or expense by the officers of municipalities in taking the assessment. They could obtain the information if suitable questions were inserted in the blanks.”

It needs no argument to show the correctness of Mr. Beadle's opinion as to the limited value of a decennial return, which, as past experience has proved, does not reach the eye of the public until three or four years after the enumer-

ators have paid their visits. At the present time, probably, fully one-half of the orchard area of Ontario, or even more, is filled with young trees, a proportion of which are coming every year into bearing, and nearly the whole of which will have fruited before the census returns, under this head, for 1881 have been issued. The Commissioners are aware that the whole question of Agricultural Statistics, which would of course include fruits, has been long regarded as pressing for solution, and cannot too earnestly express their sense of its very great importance in connection with the branch of industry they are now more particularly engaged in considering.

The Cultivation of the Apple.

Giving the first place to the most popular and by far the most largely grown fruit, the Commissioners now propose to direct their attention to the evidence relating to the cultivation of the apple. The apples referred to by the several witnesses whose oral or written statements have been received are the following, classified under the general heads of Summer, Fall, and Winter varieties:—

Summer Apples.

Red Astrachan.	Sweet Bough.
White Astrachan.	Benoni.
Early Harvest.	Summer Rose.
Tetofsky.	Early Strawberry.
Keswick Codlin.	Pomme Royal.
Early Joe.	Indian Rare Ripe.
Golden Sweet.	Summer Pearmain.

Fourteen in all.

Fall Apples.

Duchess of Oldenburg.	Black Detroit.
Gravenstein.	Taylor Fish.
Cayuga Red Streak, or Twenty-Ounce.	Porter.
St. Lawrence.	Autumn Strawberry.
Fall Pippin.	Maitland.
Holland Pippin.	Fall Jenning.
Alexander.	Blenheim Orange.
Colvert.	Sherwood's Favourite.
Hawley.	Sops of Wine.
Seck-no-Further.	Kentish Fillbasket.
Cox's Orange Pippin.	Gatineau Belle.
Maiden's Blush.	Hawthornden.
Fall Orange.	Ohio Nonpareil.

Twenty-six in all.

Winter Apples.

Northern Spy.	Talman's Sweet.
Baldwin.	Rambo.
Rhode Island Greening.	Yellow Bellflower.
Golden Russet.	Wealthy.
Swayzie Pomme Grise.	Jonathan.
Montreal Pomme Grise.	Ontario.
Æsopus Spitzenberg.	Dora.
Roxbury Russet.	Ella.
Fameuse (or Snow Apple).	Arnold's Beauty.
King of Tomkins County.	Red Canada.
Wagener.	Red Detroit.
Newtown Pippin.	Wallbridge.
Ribston Pippin.	Blenheim Orange.
Peck's Pleasant.	Ben Davis.
Grimes' Golden.	Swaar.
Peach Apple.	Bourassa.
Cranberry Pippin.	Peewaukee.
Lady Apple.	Mann Apple.
Norton's Melon.	Freckled Mollie.
American Pippin.	Prenyea.
Dominie.	Bachelor (or King of Apples).
Belmont.	Brockville Beauty.

Forty-four in all.

A Noble Catalogue—Eighty-four Varieties.

As the list stands, it shows a noble catalogue of fourteen summer, twenty-six fall, and forty-four winter—in all eighty-four—varieties, the difference in number pretty clearly defining the public estimation of the value, in an economical sense, of the several classes. It is quite possible, however, that, were it within the power of the Commissioners to institute an actual comparison between some few of the apples mentioned, they might be found to be the same fruits, under different names locally or accidentally attached to them; but this could apply only to one or two of the least known sorts. On the other hand, exhaustive as their inquiry has been, the Commissioners are aware of the existence of not a few apples that have not been referred to by any of the witnesses.

Discrepancies in Classification.

Occasional difficulties occur in the classification, the terms summer and fall, or fall and winter, being applied by different persons to the same apples. This arises probably, in some instances, from a disagreement as to the precise mean-

ing of the terms used, but also from the wide difference of climate in the large territory covered, affecting both the maturity and the constitution and, consequently, the keeping properties of the same fruits, either favourably or otherwise. In one or two instances, the Duchess of Oldenburg, almost universally termed a fall apple is mentioned as a summer fruit. The Fameuse (or Snow apple) occupies a more debateable position, for it is spoken of by some excellent authorities—including Mr. Leslie of Toronto—as a fall apple, and so appears in his catalogue. But Mr. Beadle says:—"Taking the Province as a whole, I class the Snow apple as a winter apple." And, in the district where the Fameuse attains the highest excellence—the St. Lawrence counties—it is regarded as a winter apple, and alluded to in the reports from that section as one of the best winter keeping varieties. The few other differences in classification are not of sufficient importance to require particular reference.

Comparative Hardiness of Varieties.

The first question that presents itself naturally is,—What is the comparative hardiness of the different apples constituting either class, or in what parts of the Province are particular apples found to be most successful? We shall endeavour, from the evidence before us, to supply an answer to this inquiry.

Apple Culture in the Ottawa Valley.

It is evident that the least favourable situations from which information has been collected—leaving out for the moment the new regions of Muskoka and Manitoulin—are Ottawa and Arnprior, the latter, as regards apple culture, being rather the more favoured of the two.

Mr. Bucke, of Ottawa, gives the Red Astrachan as the one summer apple in the cultivation of which some success has been attained, the Alexander and Duchess of Oldenburg as fall sorts, and Talman's Sweet, as a winter apple grown in the district. Of the three first named he says:—

"The Red Astrachan, the Duchess of Oldenburg and the Alexander appear to be the hardiest; but I do not think you could raise an orchard of them The Hon. R. W. Scott has tried apple growing. He grows the Red Astrachan and the Duchess of Oldenburg on his farm about three miles out of the city. He plants evergreens along with the trees, and I think they protect them. The land is on a limestone bed, and his experience has been measurably successful. Both Mr. Haycock and Mr. Keefer have been unsuccessful."

Mr. Bucke also mentions a local seedling known as the Gatineau Belle as "not a first-class fruit but very hardy, and ripening in September."

At Arnprior, on the Ottawa River, Mr. Usbourne of the Waba Nurseries, the property of the Renfrew Fruit and Floral Company, already mentioned, has proceeded in a very systematic manner to test the apple growing capacity of that region. He says:—

"Five years ago I imported ten of each of several different varieties of apple

tree, and put them out in nursery rows to see how they would stand the winter. They were put out in the spring. The following spring, some varieties were all alive, and all the rest died. Thirteen varieties out of fifty lived. These were the Red Astrachan, White Astrachan, Tetofsky, Sops of Wine, Duchess of Oldenburg, Fameuse, Keswick Codlin, Twenty-Ounce, English Russet, Pomme Grise, Peach Apple, Talman's Sweet, and the Wallbridge. We propagated these pretty largely. I have since discarded the Keswick Codlin, Sops of Wine, and Talman, as apples subject to be winter killed. They don't die, but are killed back. Out of all the sorts, the only varieties never injured are the White Astrachan, Tetofsky, the Duchess of Oldenburg, and the Peach Apple. We have thus established the fact that these are the sorts that will stand this climate. These four sorts have never suffered. These will in future be propagated largely. Crabs all do well. We have fruited the Tetofsky, a sweet summer apple of a small size. The Duchess, with us, ripens early in September. The White Astrachan we have not fruited sufficiently to say anything of. The Peach Apple we have not fruited. The fruit of the Duchess and the Tetofsky has been very fine, so that, both in the character of the fruit and in hardiness, these trees fully sustain their reputation."

The Talman's Sweet, mentioned by Mr. Bucke as grown—although to what extent is not indicated—at Ottawa City, is thus ruled out at Arnprior. The Red Astrachan, while cultivated, does not appear altogether to escape winter-killing. Of summer apples, the White Astrachan (only once more mentioned in the evidence), and the Tetofsky, appear to be climate-proof, and the Duchess of Oldenburg and Peach Apple are shown to be enduring varieties. The Twenty-Ounce (or Cayuga Red Streak) of fall sorts, and the Peach Apple, the Russet, Pomme Grise (called elsewhere the Montreal Pomme Grise, and a very well known and generally cultivated fruit) and the Wallbridge, of winter apples, if less capable of resisting climatic influences, are also, apparently, worth cultivating. Mr. Usbourne also says:

"We have now also some ten varieties of Russian apples on trial; they have not yet fruited."

Apple Culture in Victoria and Peterborough.

At Lindsay, again, where the conditions of northern inland cultivation are more favourable, Mr. Beall—the witness from that district—could give quite a respectable list of apples successfully cultivated, although by no means so large as those of sections still more favoured from a fruit culturist's point of view. He says, alluding first to summer apples:—

"We have the Red Astrachan, the Summer Rose and the Tetofsky. The last named is not a good apple for market use; as soon as it is about ripe it must be used, or it becomes soft and mealy."

He goes on to observe that the St. Lawrence and Alexander do very well, his preference being for the St. Lawrence, while he mentions the Fall Pippin as largely and profitably grown in the neighbourhood of Peterboro'. He adds:—

"Of winter apples grown, the kinds most esteemed are the Yellow Bellflower, the Northern Spy, the Fameuse (or Snow apple), and the Golden Russet.

Of these four, the Golden Russet stands first, the Yellow Bellflower next, and there is not much difference between the other two . . . Grimes' Golden, so far as I know, is perfectly hardy."

There are two other points referred to by this gentleman that are practically suggestive to the apple cultivator. The first is, the great effect of differences in soils and climate, at places very few miles apart, on the appearance of the apples—a strong argument in favour of careful selection, both of situation and fruits, on the part of the agriculturist who contemplates apple culture. The other is, the existence of a very large number of excellent seedlings which Mr. Beall thinks "would compare with many of the grafted kinds."

Mr. Beall especially draws attention to these, because, he says, "some of the standard varieties are too tender for our district."

And he instances, in this connection, the Early Harvest (summer) and the Rhode Island Greening and the Spitzenberg (winter) apples. Now nothing is more certain than that true acclimatization must be from the seed. As Mr. Leslie puts it in his evidence:—

"My remark as to the original growth of forest trees holds good with regard to apple trees; they must be acclimatized through the seed, where the standard varieties in cultivation will not thrive. Mere grafting or growing in any one locality I do not think has any effect at all. If you want to raise trees for a northern climate, where there is any hope of their growth at all, it must be done through the seed. If the seed is sown, the hardiest will come through and live, and the more tender ones will give way."

The seedlings alluded to by Mr. Beall are not named. Like those other seedlings mentioned in the report from the United counties of Stormont, Dundas, and Glengarry, they may, by some exceptionally severe weather be swept out of existence unless multiplied and distributed, whereas, if carefully cultivated, it is quite possible the result might be of great public benefit. The Commissioners cannot doubt but that so enthusiastic and intelligent a fruit grower as Mr. Beall will specially charge himself with the destinies of this hopeful crop of new varieties.

Apple Culture in the River Counties.

The statement from the United Counties of Dundas, Stormont and Glengarry, respecting the loss by a storm of unusual violence is as follows:—

"There were quite a number of good seedling apples, exceedingly valuable, cultivated in this district up to March, 1863, when they were lost by a thaw and following cold snap. If they were looked up, there should be some good ones still existing. The soil and climate here are very favourable to the production of good new varieties, if experiments were made. One of those lost in 1863 was an autumn apple of the size of the Golden Russet (American), and a perfect apple in shape, texture, colour of flesh and skin, aroma, etc. Fifty per cent. or upwards of the so-called standard varieties have proved too tender for our district, but a good deal depends upon location, soil, etc. It is important to get young trees

from northern nurseries. A variety from a Montreal nursery will thrive here when the same variety from Rochester would not."

The calamity referred to was evidently one of very exceptional severity, for the seedlings had not only weathered many winters and matured their growth, but had fruited and attained a high place in public estimation. Their history indicates an apple-growing capacity in the district in advance of that already attained.

Of summer apples, the three most profitable and, in that sense, it may be assumed, hardy varieties, are the Red Astrachan, Early Harvest, and Tetofsky.

Of fall apples, the most profitable to the grower are the St. Lawrence, Duchess of Oldenburg, and Alexander, classed as follows:—

"The Duchess 'very hardy and productive;' the Alexander 'very hardy;' the St. Lawrence 'less hardy but does well.'"

Of winter apples, the list is a long one, and includes the Fameuse, Swayzie Pomme Grise, Talman's Sweet, American Golden Russet, Red Canada, Spitzenberg, Northern Spy, and Yellow Pippin. The most successful are the Fameuse, Talman's Sweet, Swayzie Pomme Grise, and American Golden Russet, while to the latter, as one of the most profitable apples, is added the Brockville Beauty, an apple that appears in evidence at this point only.

If we regard the region east and north of the Bay of Quinte district as being the least favourable portion of the Province for fruit culture, we have enough evidence already to show not merely what apples may be successfully cultivated there, but that the industry is capable in those sections of considerable development. The efforts making at Arnprior and Ottawa, and the remark in the report from the United counties that "not one-fourth of the fruit trees are in full bearing"—showing as it does a very large amount of recent attention to fruit culture—prove that the people of these districts are intelligently alive to the opportunities open to them.

The Hardest Apples.

It may be interesting now to turn to some of the evidence bearing on the subject of apple hardiness generally, in order to show what more may be done, in this direction, in places where the careful selection of hardy varieties is the first essential to success.

Mr. Beadle says:—

"We are gradually getting hold of the apples which can be grown at the north with success. The Duchess of Oldenburg will grow where any apple will grow, and as far north as this Province extends. It is one of the varieties which I would recommend settlers in the northern part of the Province to try. Ben Davis will not grow as far north as the Duchess of Oldenburg, but will thrive a good way north, but in the coldest sections of the Province I would recommend the Duchess of Oldenburg, the Wealthy, the Peewaukee, and, possibly, the Mann Apple. The

Duchess of Oldenburg is a fall apple; the Wealthy is a winter apple, and so is the Peewaukee. So far as we have got the varieties it would be chiefly the fall apples which I would recommend for the climate. The Red Astrachan will grow well up towards the limit we have been speaking of. The Tetofsky is a tart apple, a long way behind the Duchess of Oldenburg, and in no way more hardy. If I were going to plant trees for cider I would plant the Tetofsky, as it abounds in juice."

We have here several apples of which no mention is made by the witnesses previously quoted in connection with the northern and most easterly districts. The first of these is the Ben Davis, only second apparently in Mr. Beadle's estimation to the hardy Duchess of Oldenburg, which "will grow where any apple will grow, and as far north as the Province extends."

The Ben Davis, says Mr. Beadle:—"Will thrive a good way north."

Mr. Dempsey, in his evidence, also refers to the Ben Davis. He says:—

"Judging by my own experience, we have no apple that can compare with the Ben Davis as a profitable market apple, if grown upon favourable locations and soil. For retailing, in Belleville, it brings the highest price of any apple we have. Grocers prefer them to the Northern Spy as a counter apple."

The Ben Davis would, from these joint testimonials, appear to deserve to be more extensively cultivated, where the soil and locality is comparatively favourable, especially where hardiness is an essential to success. Except in the report from the County of Norfolk, where it is mentioned as a successful winter variety, the Ben Davis is not further alluded to in the evidence.

But, while a qualified recommendation may be endorsed on the *carte* of the Ben Davis, the language of Mr. Beadle is far more emphatic in regard to some other varieties.

"In the coldest sections of the Province," he says, "I would recommend the Duchess of Oldenburg, the Wealthy, the Peewaukee, and, possibly, the Mann apple."

The three last are winter apples. We have additional information about the Wealthy from Mr. Morris, of Fonthill. He says:—

"There is another new apple called the Wealthy, as hardy as the Duchess of Oldenburg, and bearing later in the season. The fruit of the Wealthy is of the same character as the Fameuse. It is quite a new variety. I think myself it is going to take the place of the Fameuse. It is better than the Fameuse because it is cleaner on the outside and without scabs. It is a little larger, as tender, and, I think, has a little better flavour than the Fameuse. It originated in Minnesota, the original tree there being about sixteen years old. It bore when it was five years old from the seed, and it has borne heavy crops ever since. It is being planted very extensively in Minnesota, in fact the people have gone almost wild over it. I hardly think it would be a valuable apple for exportation. It would chiefly be advantageous to new settlers, on account of its bearing so soon and being so hardy. This variety and the Duchess of Oldenburg would be the best apples for the cold parts of the country."

Mr. Beadle is the only witness who, in his evidence, alludes to the Peewaukee; but in Mr. Leslie's catalogue it is described as—

“A seedling of the Duchess of Oldenburg, from the North-West, where it is recommended as good in quality and a good keeper. Tree productive and hardy. December to March.”

The Mann apple is mentioned by Mr. Morris as one of the most esteemed of winter varieties in his district.

The North Shore of Lake Ontario.

Leaving behind us the regions where something like a critical selection is necessary to protect the apple grower from loss, we may glance for a moment at what may be regarded perhaps as the medium or average section of the Province, in relation to apple culture, unless indeed Prince Edward County should be excepted as a district scarcely second to the most favoured. The north shore of Lake Ontario, from Toronto to the eastern end of the Bay of Quinte, has been well represented before the Commissioners. And it may be pretty safely assumed that such eminent professional culturists as Mr. Leslie of Toronto, Mr. Chaplin of Newcastle, Mr. Hinman of Grafton, and Mr. Dempsey of Prince Edward, have not been wanting in any efforts to attain in apple cultivation the largest possible measure of success. It is evident, at the same time, that, to achieve absolute success in this part of the Province, considerable care in the choice of sites may be necessary. A comparatively hardy apple may lose its reputation by injudicious placing, and, a second rate fruit in this sense, be exalted to undeserved honour by the good judgment of its planter. Mr. Dempsey, after naming the Red Astrachan and Early Harvest as the preferable summer varieties, and paying the invariable tribute of respect to the Duchess of Oldenburg as a hardy fall apple, goes on to say:—

“The St. Lawrence (fall apple) is also profitable with us, though occasionally it spots a little. I don't cultivate the Gravenstein (fall apple) very much. The tree is inclined to be tender.”

He then refers to the winter sorts as follows:—

“It is very difficult for me to say what varieties of winter apples succeed best in our district, because we have a severe climate, and such a variety of soils that in a favourable locality we can grow any variety of winter apple. Again, we have fruit growers who dare not plant the Baldwin and the Greening, while perhaps they may be grown successfully in another orchard a mile away. Judging by my own experience, we have no apple that can compare with the Ben Davis as a market apple, if grown upon favourable locations and soil. For retailing in Belleville, it brings the highest price of any apple we have. Grocers prefer them to the Northern Spy as a counter apple. The variety which I esteem best is the Red Canada, and even for market they are the best, if properly grown. They require a warm soil, and of course we have some localities which are not favourable to their growth, and in these they are liable to vary in size, and to spot. The Golden Russet does not succeed very well with us and we don't find it profitable

In favourable localities the Baldwin and Greening succeed well. The Colvert, if properly handled, is a profitable apple, though it does not belong to the winter varieties. It should be picked early in the season, even when it is quite green; if so picked, it is one of the most profitable apples for shipment to Europe, as it commands fancy prices. We grow a considerable number of Snow apples. You will find it flourishing in some localities, and perhaps forty rods away it is a failure. I could never understand the cause of this peculiarity. We have no tree that is more hardy, but the fruit is liable to spot."

Northumbrian Seedlings.

In Mr. Hinman's evidence we again drop upon a cluster of seedlings hardy and prolific, and, although the collaterals of three generations, still without a name. Mr. Hinman says:—

"There are some seedling apples on my farm which have been there over eighty years, and while those which my grandfather grafted had mostly died, those which were left in their natural state survived, and still bear freely; they have no local name."

It would be a source of much gratification if these tough old patriarchs could even yet be utilized for the propagation of their hardy characteristics beyond the limits of Mr. Hinman's nursery. Of the hardness of established varieties, Mr. Hinman says:—

"I can hardly say what varieties of apples are best for the district, as I have not given them all a fair trial. The Rhode Island Greening and the Spitzenberg have proved to be the hardiest varieties in the older orchards, though we have better shipping apples, such as the King of Tomkins County and the Holland Pippin. The Northern Spy is one of our best varieties for general purposes. The fruit of the Baldwin is good, but the tree does not stand the climate very well. It, and the Northern Spy are most in demand for shipping."

For hardness, in this particular section the preference is thus given to the Rhode Island Greening, and the Spitzenberg, while the Baldwin exhibits a tenderness that mars its utility. But the list is a very limited one, and it cannot be doubted might be considerably enlarged in directions already indicated.

Mr. Chaplin's remarks seem to apply less to the point we are now particularly discussing than to the general merits of his trees. Mr. Leslie, alluding first to summer varieties, mentions the Early Harvest, Red Astrachan, and Keswick Codlin as "particularly hardy trees in fruit growing sections."

And of the Red Astrachan, he says:—"It is probably the hardiest of the very early apples."

Of the fall varieties he commends especially for hardness the Duchess of Oldenburg, and Alexander. He speaks, however, less of his own immediate district or orchards than of sections, already noticed, where hardness is the first necessity of apple-growing. He localizes winter apples in the following manner:—

"Of winter apples, the Baldwin and Rhode Island Greening require the most favoured portion of the Province; you cannot take them much farther north than Toronto to advantage. The Rambo may also be classed with these varieties. The Northern Spy and King of Tomkins County are hardier. The Swayzie Pomme Grise, American Golden Russet, and Yellow Bellflower are very hardy. The Ribston Pippin and Swaar are medium."

With still greater precision he says:—

"The hardest varieties are the American Golden Russet, the Swayzie Pomme Grise, and the Yellow Bellflower, and you might add to the list the Montreal Pomme Grise, which does well at and about Montreal."

The Montreal Pomme Grise is, it will be recollected, in the list of thirteen survivors out of fifty tested at Arnprior and referred to by Mr. Usborne, as having, in consequence, been propagated largely. The Swayzie Pomme Grise, although an apple of Canadian origin, comes from the warm region of Niagara. But while a most delicious fruit, "the best dessert apple in the world," as Mr. Leslie calls it, a most prolific bearer and the "highest priced apple ever shipped," it is also "one of the very hardest." Mr. Leslie says of it:—

"The tree is one of the very hardest, and in view of the demand for the fruit, it is one to which we might turn with good prospect of success. It is not largely cultivated at present; though it has been grown a long time it has not got into general cultivation for some reason. It is a Canadian tree, a native of the Niagara district, and is cultivated to some extent there."

The Western Counties.

Westward from Toronto we are generally free from the unfavourable conditions, using the term in a comparative sense, that may affect the fruit grower to the east of the capital of the Province. It may be laid down as a broad general rule that, whatever apple will grow at the east or north of Toronto, will grow in the western or southwestern counties, although in the latter there are occasional situations where prudence in the selection of trees must be exercised. We shall now speak therefore of the relative hardness of the several varieties, on the supposition that they meet in the western half of the Province on a common level, and without reference to their adaptability for successful cultivation or otherwise in the north or east.

Summer Varieties.

Of the summer varieties, the Red Astrachan, the Early Harvest, the Tetofsky, and the Keswick Codlin are, with the exception of the White Astrachan, which is but once mentioned, the only apples the hardness of which is specially referred to, and that in connection with the colder sections of the Province only. There is no evidence to show, however, that, under ordinary circumstances, the eight or nine other summer sorts would not be equally safe from misadventure.

Fall Varieties.

In regard to the fall apples, the choice is a little more marked. From Bruce the report is most favourable to the Duchess of Oldenburg, the Gravenstein, Alexander, Maidens' Blush and Colvert. In the Niagara district Mr. Beadle can "make no distinction in regard to hardiness."

In Elgin, for hardiness and productiveness combined, the award is given to the Ohio Nonpareil, Gravenstein, Bellflower, and Pippins. In Kent, Mr. Westland classes as equally hardy the Cayuga Redstreak, the St. Lawrence, the Seek-no-Further, and the Fall Pippin. In the same county Mr. Cady "does not think there is much difference," but gives the preference, on the whole, to the Rambo and the St. Lawrence, the first named, however, being classed in this report as a winter apple.

In the report from Norfolk, the preference for hardiness is given to the Duchess of Oldenburg, the Maiden's Blush and Gravenstein. It is probable that in western Ontario the test of hardiness is hardly severe enough to affect seriously the credit of any of the fall varieties.

Winter Varieties.

In winter apples, the fruit-growers appear to be more critical; and the question of hardiness comes more conspicuously to the front. Of the forty-four varieties on the list, allusion has already been made to the Swayzie Pomme Grise, the Montreal Pomme Grise, the Fameuse, Grimes' Golden, the Wallbridge, the Brockville Beauty, the Peach apple, the Ben Davis, the Peewaukee, and the Mann, in terms which render further reference to their hardiness quite unnecessary. To the hardiness of the Jonathan, Bachelor, American Pippin, Blenheim Orange, Red Detroit, Peck's Pleasant, Newtown Pippin, Cranberry Pippin, Lady Apple, and the five or six new apples, no direct reference is made in the evidence. To the hardiness or otherwise of the Northern Spy, the Baldwin, the Golden Russet, the Rhode Island Greening, the Roxbury Russet, the Wagener, the Talman's Sweet, Yellow Bellflower, Belmont, King of Tomkins County, Ribston Pippin, Red Canada, and Æsopus Spitzenberg allusion is made in several instances.

In Brant, Mr. Arnold finds the Baldwin and the Rhode Island Greening not reliable. He says:—"They are tender unless worked on other trees."

Mr. Cady, from Kent, gives to the Wagener a special certificate for hardiness. With Mr. Mackenzie Ross, near Chatham, in Kent, the Æsopus Spitzenberg "does not succeed very well."

Mr. Hagaman, at Oakville, reports,—

"The Roxbury Russet is not very tough in the wood; the Baldwin not so healthy in the wood and is sometimes killed in the tops."

In contradistinction to the evidence of Mr. Arnold's experience in Brant, Mr. Toll, from Kent, says: "the Rhode Island Greening never winter-kills with us."

Mr. David Caldwell, from Waterloo County, and whose orchard is in a high situation says:—

"The apple that succeeds best with us is the Northern Spy. . . . The next best apple is the Rhode Island Greening."

While referring to the *Æsopus Spitzenberg* as a fine apple, Mr. Caldwell remarks as a drawback that "the tree is usually delicate."

In regard to hardiness, Mr. Roy, of Owen Sound, says:

"I don't think that any of the standard varieties have proved too tender for our district. We thought at one time the Baldwin was tender, but now, as soon as it is grown up and seven or eight years old, I find it to be very hardy and to bear very good fruit."

In Bruce, all the standard varieties are reported as succeeding well.

In Lambton, the Baldwin is found to be "rather tender for this district."

In Perth, while the Baldwin is mentioned as a very valuable and highly esteemed variety, we read:

"The King of Tomkins County, Baldwin and Rhode Island Greening have sometimes shown signs of tenderness in severe winters."

In Elgin, the Baldwin is "the only variety that appears to be too tender for some severe winters."

While in the year 1875 a very severe frost destroyed some trees of the Baldwin, Wagener, and Colvert varieties, at Houghton, in Norfolk, the case was altogether an extraordinary one, and in no other year has a similar experience occurred.

Mr. Leslie speaks of the Yellow Bellflower as "very hardy," while from Elgin and Norfolk the reports allude to it, respectively, as "profitable," and among the sorts that "succeed best."

From Norfolk, comes a word of commendation for the Belmont and Dominie.

Mr. Leslie gives to the King of Tomkins County the credit of being hardy, but, although in Norfolk it is reported as one of the most successful, in Perth it is found to show "some signs of tenderness in severe winters."

To the Swaar, Mr. Leslie gives the designation of "medium," although the apple does well in the more southern counties.

The Ribston Pippin, although classed by Mr. Leslie as "medium," in respect of hardiness, is "grown successfully" by Mr. Arnold, at Paris, and also placed in the front rank in other western counties.

With the few exceptions above given, the whole of the leading standard varieties may be said to succeed well in resisting unfavourable climatic influences

in western Ontario. The Northern Spy, the Golden Russet, the Talman's Sweet, and the Red Canada appear to have been so hardy as to escape even exceptionally trying seasons. As already remarked, those varieties that hold their own successfully against climate in the eastern half of the Province need no testimonial to their hardiness in the west.

Comparative Economical Merits.

Having thus, at some length, considered the conditions of apple culture, and indicated where apples may be grown, and what varieties may, in the respective districts, be cultivated with safety and probability of success, the next point to be discussed will be the merits, in an economical sense, of the different apples. In the first place, we may inquire:—What are the special characteristics of the various sorts, other than the one of hardiness, which has been already disposed of?

Merits of Summer Apples.

"The Red Astrachan and Early Harvest are the most profitable of early summer apples," is the testimony of Mr. Beadle. They both carry well, and the Red Astrachan has the further advantage of being an early bearer. "The Red Astrachan . . . and the Keswick Codlin will bear in three years." "The Red Astrachan and the Early Harvest . . . both carry well." Mr. Beadle further says:

"The Keswick Codlin is valuable chiefly as a cooking apple. The Early Harvest and Red Astrachan are valuable for dessert, but are good for cooking also. The Benoni is a variety which is much esteemed for dessert, but is not worth much for cooking. The Sweet Bough is the best of the sweet apples, and it is good for dessert to those who like a sweet apple."

"Of summer apples for profit I prefer the Early Harvest and Red Astrachan," is the verdict of Mr. Dempsey.

Mr. Beall speaks of the demand for summer apples, in his district, being in advance of the supply, particularly for the Red Astrachan, which brings as much as from \$2 to \$2.50 a barrel. The other varieties he names are the Summer Rose and the Tetofsky. Of the latter he says:

"The last named is not a good apple for market use; as soon as it is about ripe it must be used or it becomes soft and mealy."

Mr. Arnold's opinion is summed up as follows:—

"For an early dessert apple, I would take the Summer Rose, and next to it the Early Strawberry. The Benoni would come third, and then Pomme Royal, which is a very fine dessert apple. For an early cooking apple, I would take the Red Astrachan. There are very few of these that come to market as such, except the Red Astrachan. I have frequently sent the Early Strawberry and Benoni to Hamilton at \$2.50, and have got a telegram saying 'send on all of those little red apples that you have got.' The Red Astrachan brings sometimes \$1 a bushel. It generally sells from that downwards."

In the Ottawa valley counties, the question is limited pretty much to the enduring capacity of the fruit, and the choice is consequently limited. In the United Counties, the Early Harvest and Red Astrachan are mentioned simply as the most profitable. Also as the most profitable, Mr. Leslie recommends of summer apples, the Early Harvest, Red Astrachan and Keswick Codlin.

Mr. Hinman speaks of the Early Harvest, the Red Astrachan, the Sweet Bough, and the Golden Sweet as the best summer varieties. The two first named in the group are the favourites of Mr. Chaplin.

In the report from Bruce, the favourable notice of the Early Harvest and Red Astrachan is extended to the Summer Pearmain.

Mr. Allan, of Goderich, says:—

“The summer apples most profitable are: Red Astrachan, which we use for both cooking and market; Keswick Codlin for cooking; the Early Joe and the Indian Rare Ripe for dessert. The Tetofsky is being cultivated and is much thought of by some growers. Upon some soils it is about as early as the Astrachan.”

In some dozen other reports, the Red Astrachan is alluded to favourably in all cases; the Early Harvest in nine, the Tetofsky in three, the Keswick Codlin in two, and the Sweet Bough in one. Reviewing the several statements, the first place must be given to the Red Astrachan, with the Early Harvest in close attendance, if not quite on an equality. The Keswick Codlin has many friends, but the Tetofsky, described by Mr. Beadle as, “a tart apple a long way behind the Duchess of Oldenburg,” while freely cultivated has, in some quarters but a third-class reputation. The other summer varieties are, as will be observed, the subjects of only occasional notice, and probably of individual and local preference, rather than of general popularity.

In dealing with the summer apple, we have to bear in mind that its claims to favour are, by force of circumstances, fewer, and its critics are far less exacting, than are those of the winter, or even fall varieties. The simultaneous appearance of the pear, and the plum, and other fruits, renders the summer apple, relatively, of far less importance than the later sorts. In those which may be termed the chief apple growing districts, the supply far exceeds the demand. Thus we read in many of the statements, that the crop is frequently left to rot on the ground or fed to pigs. Cider making is followed to a limited extent only, in Canada, and the summer fruit season is one of so much activity in all other respects to the farmer, that he pays little attention to fruit until the comparative leisure of the fall months. The market for summer apples is, consequently, a purely local one, or, at all events, limited to the Dominion. The sale within the latter, may be enlarged, when increased railway facilities admit of speedy and direct shipment to Manitoba and the North-West, or the new drying process, to which we shall refer later on, has been fully tested and proved to be successful. So far as the profitable cultivation of summer apples at present goes, it is probable that much extension in the western counties is not desirable. To the eastward

and northward, as the results obtained by Mr. Beall and others show, there is still plenty of room for the enlargement of this branch of apple culture.

Merits of Fall Apples.

Of fall apples the varieties most prominently mentioned are the Duchess of Oldenburg, Gravenstein, St. Lawrence, Fall Pippin, Colvert, Cayuga Red Streak (or Twenty-Ounce), Alexander, Seek-no-Further, Maiden's Blush, and Holland Pippin. Before remarking on these in detail, we shall briefly notice the other fall apples in our list:—

The Hawley is the subject of conflicting opinion. Mr. Beadle speaks of it as "not profitable; a large showy apple, but the flesh is soft and it perishes soon."

Mr. Arnold, on the other hand, says:—"I should be sorry to be without the Hawley, because it is a splendid apple for cooking and dessert."

As no other witness refers to the Hawley, the Commissioners will not presume to decide between these high authorities. The Black Detroit, the Taylor Fish, the Porter, the Maitland, the Kentish Fillbasket, the Blenheim Orange, the Fall Jenneting, Sops of Wine, Sherwood's Favourite, the Ohio Nonpareil, and the Fall Orange, are each mentioned once, but once only.

Mr. Cady only refers to the Black Detroit to say it is deemed "unworthy of cultivation." The Maitland, Taylor Fish, and Kentish Fillbasket are alluded to by Mr. Allan, of Goderich, in the following paragraph:—

"The Maitland is a very fine apple, about the size and shape of the King of Tomkins County, and is a prolific and regular bearer. The flavour is good, crisp, vinous and pleasing. An English apple named the Taylor Fish is very highly esteemed; indeed I consider it the best fall cooking apple we have, and when perfectly ripe it is quite pleasant to eat. The tree is a rapid grower, bears early and regularly heavy crops. The apple is much of the size and form of the Kentish Fillbasket."

The commendation of the Maitland and Taylor Fish is strong; the reference to the Kentish Fillbasket is only incidental. The Porter also owes the notice of its value to Mr. Allan, who describes it as one of the most profitable of fall apples, as well as hardy.

The Blenheim Orange is one of the fall varieties recommended by Mr. Beadle. The Fall Jenneting is spoken of favourably by Mr. Chaplin, of Newcastle.

The Sops of Wine was one of the varieties ruled out by Mr. Usborne at Arnprior, as subject to being winter-killed, and no mention is made of its value in any respect.

Sherwood's Favourite is described by Mr. Morris, of Fonthill, as "one of the fall apples most profitable to the grower."

The Ohio Nonpareil and the Fall Orange are found to be profitable fall apples in the county of Elgin. In addition to the apples above referred to, and the

leading varieties to be hereafter noticed, the Autumn Strawberry is commended by Mr. Allan as a profitable fruit, and his opinion is endorsed by others.

Cox's Orange Pippin is one of the fall apples "most esteemed" by so good a judge as Mr. Charles Arnold, who, referring to it a second time, says:—

"Cox's Orange Pippin is a very fine apple, of excellent flavour, and though it is not quite bright enough, is suitable for the English market."

"The Hawthornden," says the report from Lambton, "bears about three or four years after grafting;" a very strong recommendation to new beginners in apple culture. In a further reference to the Hawthornden from the same source it is stated to be one of the two apples mentioned "most profitable to the grower."

Principal Fall Varieties.

The following standard varieties of fall apples will now be noticed in order:—The Duchess of Oldenburg, Gravenstein, St. Lawrence, Fall Pippin, Colvert, Cayuga Red Streak (or Twenty-Ounce), Alexander, Seek-no-Further, Maiden's Blush and Holland Pippin.

Taking into account its combined qualities, of hardiness (already referred to), of the early maturity of the tree, and its productiveness as a fruit bearer, the first place in this list must unhesitatingly be conceded to the Duchess of Oldenburg. In one instance only is it relegated to an inferior position when Mr. Arnold says:—

"The Duchess of Oldenburg is not in favour with us because there are so many better."

The Gravenstein is classed by Mr. Beadle as "head and shoulders above all other apples for dessert;" but he ranks it second to the Duchess on general grounds.

Mr. Arnold places it first on the list of his most esteemed varieties of fall apples.

Mr. Leslie places it fourth on the list of the "most profitable," but notices it as being next to the Duchess in early ripening.

Mr. Beadle declares the St. Lawrence to be an apple which "it is not profitable to grow in our (Niagara) section of the country."

Mr. Dempsey does not concur with Mr. Beadle in his estimate of the St. Lawrence. Possibly a difference of situation may have an influence on the fruit and on the divergent judgments of these experts. After remarking that "the St. Lawrence is also profitable with us, though it occasionally spots a little," Mr. Dempsey goes on to say:—

"I agree with Mr. Beadle as to the qualities of the Duchess of Oldenburg, but I cannot tell why I do not concur with him as to the St. Lawrence. I have only one tree of that variety in my garden, it has been planted fifteen years, and though it only bears alternate years, when it does fruit it produces about six barrels of the best quality of apples, which would be an average of about three barrels

per annum. If the Duchess of Oldenburg is not allowed to overbear, it will bear annually, but if it does overbear the fruit is liable to split. If a portion of the crop is shaken off the tree when it is too heavy it will bear annually."

Mr. Beall, in a district where some more tender varieties would be altogether unsuccessful, says of the St. Lawrence :—

"The St. Lawrence is the only variety that I am aware of which can be regarded as a profitable fall apple with us. The fall apples grown in our neighbourhood nearly supply the demand, and so cheaply that outsiders cannot compete. Large quantities of them are sold at seventy-five cents to a dollar per barrel. I use the term barrel because it has been employed here, but with us no person barrels his apples."

The St. Lawrence is also mentioned in favourable terms, and without any disparaging comments by nearly all the other orchardists examined.

Of the Fall Pippin, Mr. Beadle says :—

"Some years ago the Fall Pippin was very popular as a cooking apple, but its popularity has fallen away of late years, as it is subject to the spotting of which I spoke with regard to the Snow apples. . . . Of the varieties cultivated in our district which I would not recommend, there is, first, the Fall Pippin. It is a poor bearer, and shows bruises badly by discolouration."

On the other hand Mr. Beall tells us :—

"In the neighbourhood of Peterboro' the Fall Pippin is largely grown, and is a very profitable apple."

It must be recollected, however, that apple culture is carried on under very different conditions in the two districts, and that the standard of criticism in fruit-abounding Niagara is very different from that which is likely to prevail in Peterborough. Of the Fall Pippin, Messrs. Allan, Cady, Westland, and others, speak favourably.

The Colvert is alluded to in very favourable terms by Mr. Dempsey. He says :—

"There is a gentleman near me who has an orchard of 100 Colverts, with which I am just as familiar as my own. The trees have been planted about fourteen years, and have attained a size of about seven inches in diameter. Last year they took about 175 barrels from it, but that was not an average crop. Taking one year with another, we could safely calculate upon an average crop of 200 barrels. . . . The Colvert, if properly handled, is a profitable apple, though it does not belong to the winter varieties. It should be picked early in the season, even when it is quite green; if so picked it is one of the most profitable apples for shipment to Europe, as it commands fancy prices."

Mr. Leslie also reports that the Colvert has been exported profitably. He says :—

"The Colvert has been shipped to the old country, picked a little on the green side and immediately sent off. It has arrived on the other side in splendid condition. The Fall Pippin, Cayuga Red Streak, Alexander, and Fameuse, treated in the same way, have also been successfully shipped."

The Cayuga Red Streak (or Twenty-Ounce) is mentioned by Mr. Leslie in conjunction with the Colvert as a shipping apple. It is classed by Mr. Beadle as one of the four highest priced fall varieties, its merits as a cooking apple being also noticed by the same witness. Mr. Allan, of Goderich, speaks of it favourably, and Mr. Pettit, of Grimsby, is also shipping it to Europe.

The Alexander is mentioned in the character of a profitable fall variety by Mr. Allan and Mr. Leslie, and as doing well in his district, by Mr. Beall.

Of the Seek-no-Further Mr. D. Caldwell, of Waterloo, says:—

“The Seek-no-Further apple, which belongs to the family of the Spitzenberg, is also a fine apple. So is the *Æsopus Spitzenberg*; but the tree is usually delicate, and the fruit seems to be so subject to worms and insects that we find it unprofitable. It, however, commands the highest price in the British or any other market. I see the Seek-no-Further apple labelled “*Spitzenbergs*,” and they come so near the real *Æsopus* that, when they go into the British market, they are not questioned, but command a good price.”

Mr. McKenzie Ross speaks of the Seek-no-Further as “a very delicious apple,” and others also testify in its favour.

The Maiden's Blush is classed by Mr. Dougall among the varieties of fall apples most preferred by him, and in Bruce and Norfolk it is also apparently a favourite.

Mr. Beadle says of the Holland Pippin:—

“It is a cousin of the Fall Pippin, and used to be very popular, but it is found that it is not valuable for shipping or market, compared with the others I have named. It is mentioned, however, as a good fall apple by some other witnesses.”

In dealing with the fall varieties of apples, we obtain the first glimpse of a market and demand beyond the confines of the Dominion. With the possibility of extending the trade in certain fall varieties abroad, and the supremacy of the apple as a fruit for domestic use after the supply of summer fruits incapable of preservation in a green state has ceased, the cultivation of fall varieties cannot yet be said to be overdone, or even to have attained to its natural limits.

Merits of Winter Apples.

An inquiry into the economical merits of the winter apple covers a wider field than does that which has preceded it. We have already discussed very fully the question of hardiness and adaptability to climate of the respective members of each of the several varieties. The present examination includes such subjects as age of maturing productiveness, shipping qualities, home and foreign demand, and wintering qualities.

Out of the forty-three varieties several are new, and, although none the less valuable or interesting on that account, have hardly yet established a reputation or become generally known. But they deserve very prominent notice nevertheless. To the production of some of these, the country is indebted to the ability and enterprise of Mr. Charles Arnold, who stands high in the ranks of successful hybridists. His new varieties are five in number; the Ontario, Arnold's Beauty, the Ella, the Dora, and one not yet named. The last consequently is not mentioned in our list. Mr. Arnold thus alludes to them:—

“I have experimented for a number of years in hybridizing apples, and of those I have raised I have five very promising seedlings. I think the Ontario, which was sent out by the Fruit Growers' Association two years ago, has no superior as a cooking or shipping apple. I have kept it as late as the first of July. It is a seedling of the Northern Spy crossed with the Wagener. Of the other four, the one I have called the Dora is a very good dessert apple, beautifully marked. Another one, which, at the request of Mr. Downing, of Newburg, I called Arnold's Beauty, is a yellow apple with red cheeks, and is a first-class keeping apple. There is another, called the Ella, which in appearance is very much like the Black Gilliflower. It is not pretty, is a poor grower, but it is a delicious apple. The fourth of my seedlings has never been named or sent out, though Mr. Downing has urged me to send it out, as it is an excellent dessert apple. By Mr. Downing I mean Charles Downing, of Newburg, N.Y., who is considered the best authority on apples and fruits generally in America. I submitted them to him, and he wished me to send him scions. I also sent them to the Royal Horticultural Society of England. The one which the Fruit Growers' Association here pronounced the best, the Royal Horticultural Society would not look at, but they sent me a kind of diploma, and spoke very highly of the other three, that is, the Ella, the Dora, and Arnold's Beauty. They were among the fruits exhibited at the Centennial Exhibition, where I received a medal for the best series of hybrids.”

Questioned further, Mr. Arnold went on to say:—

“With regard to the Ontario apple, the characteristics of the fruit strongly resemble those of the Northern Spy. On the blossom end it is very like the Northern Spy, and on the other it has a strong resemblance to the Wagener. It is about the size of the Spy, but flatter and slightly more acid. It is a beautiful red apple, but too tart to suit me. It would not be used in England for a dessert apple as it is too large. It is a good cooking apple. I have never shipped apples to England, except such as I have sent to ascertain the taste of the people. I have not tested the Ontario in the English market because there is only one bearing tree in existence. Assuming that it can be sent in sufficient quantity, I should think it would be a profitable apple, because it is superior to the Baldwin, which is perhaps the most profitable of all apples to ship. I think it is a good apple, and will compare favourably with the very best, but I expect to get better apples than it is. I am satisfied as to its bearing qualities, as it has borne well every year.”

Thus in the Ontario we have a fine cooking apple, an excellent shipper, and one that will keep to the end of the July following its growth. In the latter respect it has a rival in Arnold's Beauty. The Ella hardly challenges competition on economical grounds, but is “delicious.” The nameless seedling, too, is an excellent dessert apple. The Dora is not particularly described, but appears to have sufficiently high merits to be classed with the others in a group of hybrids

that secured to their originator the first place among hybridists at the Centennial Exhibition.

Mr. Dempsey calls attention in his evidence to an apple which would appear to well deserve the notice of fruit growers. He says:—

“We have an apple in our locality to which I think some attention should be called. I noticed that in quotations from England there is a variety called the Rock Apple, which has commanded a very high place there. It is described as a flat red apple, with specks, and having a large open calyx. We grow an apple exactly of that description. I had some which were rolled out on the first of July, and I found it was not necessary to re-pack them, and sent them to the market. They brought a very good price. We call them the Freckled Mollie, though I am satisfied that it is the same variety which commands so high a price in England. The apple is liable to get a little one-sided; it is a very dark red in colour. It cannot be cooked soft. The reason it brings such a price is because of its long keeping. I think that quite recently it commanded forty-eight shillings a barrel in England. It does not grow in sufficient quantities in our section to be shipped from there, and I think the supplies must have come from farther east.”

It will be interesting to know more of this fruit, and whether it is the sole representative of its family in the Province. Possessing qualities that enable it to be kept until late in the summer, an inquiry into the sources from which it is supplied cannot fail to be of advantage

The merits of the Wealthy apple have been already noticed. Its hardiness appears to be its great recommendation. But it is also an early bearer and a free-grower. It originated in Minnesota sixteen years ago. The tree fruited when only five years from the seed and has borne a heavy crop ever since. So strongly has it commended itself to the people of Minnesota that we are told by Mr. Morris:—

“It is being planted very extensively in Minnesota, in fact, the people have gone almost wild over it.”

The Peewaukee, the offspring of some chance cross upon the Duchess of Oldenburg, has developed into a winter apple, and a good keeper, while it preserves the hardy characteristics of the Duchess.

Some eighteen or nineteen varieties, mentioned once or twice only in the evidence, may next be briefly referred to.

The Brockville Beauty has an eastern reputation, and is spoken of as one of the varieties “most profitable for the home market.”

The Dominie is commended from Norfolk for its keeping qualities.

Mr. Dougall, of Windsor, says of the Jonathan:—

“The favourites are . . . and the Jonathan, which is allied to the Spitzenberg, and is a great bearer. . . I think, perhaps, that the Jonathan would be the best winter apple for a person to plant for marketable fruit.”

Mr. McKenzie Ross, from Chatham, commends the Bachelor (or King of Apples) as "a small apple but very delicious;" and the Lady Apple (or Pomme D'Api), as "a picture of beauty." The latter is a small but inviting dessert fruit, and bears profusely.

Mr. Dempsey calls attention to the Prenyea, an apple grown only in his neighborhood, and described by him as being esteemed very highly as a dessert and cooking apple.

Of the Rambo, Mr. Cady, from Kent, who classes the Rambo among fall varieties, after speaking of it as productive, says:—

"If the Rambo is neglected it is apt to grow irregularly as to size, but we find that if they are properly cultivated and pruned, they grow to an even size, and are a very fair class of apples."

Mr. Leslie, who places the Rambo among winter apples, speaks of it as one of the best, but adds that it is one of the sorts which cannot be cultivated profitably much further north than Toronto.

Mr. Morris is the only witness who alludes to the American Pippin, but what he says is important. He says, alluding to winter apples:—

"In our section the American Pippin has been the most profitable. It is an apple that is not very well known. It is of medium size, about the size and shape of a Baldwin, but green, striped with dull red. It will keep till June. Its shipping qualities make it very valuable, it being considered the best to ship. This apple will generally bring from twenty-five to fifty cents more than other varieties. The apples are generally shipped to Montreal from our place. The buyers there ship them to hot countries. It has an enormous crop, and bears every year."

Downing, the great American pomologist, says of the American Pippin:—
"It is valuable only for its late keeping and for cider" He describes the flesh as white, firm and juicy, with a brisk acid flavour.

Of medium size, with some colour, shipping and keeping qualities of so high an order that it is sought for in countries where the preservation of green fruit is most difficult, and the bearer of an "enormous crop" annually, the American Pippin cannot fail to deserve the attention of orchardists. Although Mr. Downing's description of the American Pippin is not tempting to the Canadian connoisseur in apples, it is quite possible that in hot countries the slight acidity enhances its value, while, at the same time, tending to promote the keeping qualities referred to in both the above quotations.

The Pomme Grise, or Montreal Pomme Grise, is referred to by Mr. Beadle as one of the esteemed varieties. Its hardiness has already been spoken of.

The Belmont is classed among the most successful winter sorts in the report from Norfolk.

Mr. Dougall recommends the Blenheim Orange as a favourite for cooking purposes, and also advises its cultivation as a dessert apple.

The Red Detroit, says Mr. Cady :—

“Is a new apple, and has not been tested in our neighbourhood. . . . The Red Detroit is a large, fine-looking apple, conical in shape, with a fine glossy skin, and would measure as much as ten inches in circumference.”

As a dessert apple Mr. Cady classes Peck's Pleasant before the Northern Spy and other leading varieties, and also speaks highly of its commercial value for export. The same apple is noticed favourably in the report from Bruce.

Of the economical merits of the Wallbridge, the evidence before the Commission says nothing.

The Bourassa is alluded to by Mr. Cady as being, in his experience, “the best keeping apple.”

The Swaar is noticed favourably in one or two instances in general terms.

Of the Cranberry Pippin, Mr. Pettit of Grimsby, says :—“It is a good cooking apple, and crops very well.” It is also, he mentions, one of the varieties he is selecting for export to Europe.

The Peach apple in the evidence receives an incidental notice for hardness only. But, from the fact that its hardness had been tested under severe conditions, and been, so far, well sustained, it was thought desirable to make a little further inquiry respecting the Peach apple. It is an old variety, although for some reason it has never been popular here. An eminent Canadian pomologist, however, to whom a specimen, taken from a tree growing at Toronto, was submitted, says :—

“The specimen you send corresponds with Downing's description of the fruit, excepting in the colour of the flesh, which he describes as white, but which in your specimen is yellowish. This, however, might have become changed somewhat by keeping. Downing speaks of it as a good keeper, and gives its season as from December to April, thus placing it among winter fruits. From the specimen you send I am favorably impressed with this apple, and think it would sell well as a dessert fruit, its high flavour and crisp, juicy flesh being strong points in its favour.”

Since the evidence now under review was in type, a communication has been received from Mr. R. N. Ball, of Holmhurst, Niagara, containing a great deal of extremely useful information, both as to the foreign market for apples and the mode

of shipment, subjects on which, as a very large exporter, Mr. Ball is able to speak with great authority. Referring to the Mann apple, Mr. Ball says:—

“There is a comparatively new apple—the Mann—which promises to establish a high reputation in the English market, especially if shipped in the spring.”

The Mann apple, suggested as a hardy apple by Mr. Beadle, is also classed among “the most esteemed varieties,” by Mr. Morris.

Of Norton’s Melon Mr. Beadle says:—

“For early winter Norton’s Melon is a good dessert apple, but it is not very abundant.”

Standard Winter Varieties.

Up to this point we have discovered in the list thus rapidly glanced over, abundant materials for apple growing on a large and profitable scale, but we have not yet touched the heart and foundation of this branch of industry, so far as winter apples are concerned. Under the head of established standard varieties of winter apples we class the following:—

Northern Spy	Swayzie Pomme Grise,
Baldwin,	Fameuse,
Rhode Island Greening,	Yellow Bellflower,
Æsopus Spitzenberg,	King of Tomkins County,
Golden Russet,	Wagener,
Roxbury Russet,	Newtown Pippin,
Ribston Pippin,	Talman’s Sweet,
Red Canada,	Grimes’ Golden.
Ben Davis,	

We shall examine the claims to merit on economical grounds of these apples in the order in which they are above mentioned.

Mr. Beadle says of the Northern Spy:—

“The Northern Spy is quite late (as a bearer) and attains considerable size before it bears—about ten years I should say.”

Conceding its good keeping qualities, Mr. Beadle says further:—

“The Northern Spy is a very fruitful tree, when it begins to bear, but I don’t know that it compensates by its fruitfulness for the time required to bring it to maturity, and the great care required in order that it may produce perfect fruit. It is a very long-lived tree, notwithstanding that it is so prolific. . . . The Northern Spy, from the fact that it is so late in coming to bear, and also that it requires so much care after it does bear, has not attained a very high position among our orchardists. I only know of one orchard devoted to the Northern Spy, and that is in the County of Halton. In it there are several hundred trees of that

variety. When it first came into bearing I used to hear a good deal about it. Mr. Springer owned it then, and used to bring samples to our meetings, but I have heard nothing of his success for the last few years. Speaking from recollection of my last conversation with him, he was meeting with the difficulty I have spoken of—that there was such a tendency towards bearing large crops, the labour of thinning out was very large; and unless you can get well developed specimens they are useless.”

Mr. Dempsey says of an orchard in his neighbourhood where the trees are of this variety:—

“I don’t know the age of the trees, but they have been neglected. The orchard produces from three to six barrels per annum per tree.”

Mr. Dempsey also speaks highly of the Spy both as a shipper and keeper.

Mr. Arnold pays a tribute to the qualities of the Spy as an apple in demand for both home and foreign markets, but places it lower than some others in commercial value for shipping. He also testifies to its good keeping qualities. “If the skin is not bruised,” he says, “it will keep till May.”

Mr. Allan, of Goderich, says:—

“The Northern Spy is rated No. 1 with us. . . . Choice Northern Spy and Rhode Island Greening apples always command the highest price. . . . For the home market the Northern Spy, the Rhode Island Greening, and the Baldwin, are the most asked for. None of our storekeepers think of keeping any others than these and the Fameuse. For shipping, the Northern Spy comes first again. They are a little tender-skinned, but when properly packed they carry well.”

Mr. Allan further states that a quantity of Northern Spy apples formed part of a shipment to England in 1879, and the purchaser asks for a larger shipment at advanced figures this year.

Mr. Dougall, of Windsor, after speaking of the Northern Spy as a good dessert apple, says:—

“The Northern Spy is very long in coming into bearing except in a warm, gravelly soil. When it does come in it is a very good bearing apple, although it is apt to have a great many small, worthless apples on the tree.”

Its tardiness in maturing is referred to by Mr. Toll, from Kent, who says:

“We cultivate the Northern Spy, and we find it to be a very good apple, but it is a long time coming into bearing; the trees do not begin to bear paying crops until they are about fifteen years old.”

Mr. Caldwell, of Waterloo, also refers to this unfavourable characteristic, but says:

“The apple that succeeds best with us is, I think, the Northern Spy, for a winter apple. Those persons who go into fruit growing for shipment consider it the leading apple for their purpose. The only objection to it, is that it is long in bearing; but it is such a valuable tree and such a long and steady bearer, that it is preferred, and there is money in it.”

To its value for shipping, Messrs. Leslie, Roy, Hinman and Chaplin also

testify, as well as others. Summing up its merits, and demerits or drawbacks, they may be briefly stated as follows :

The Spy is an excellent fruit, keeping well, always in good demand at home, and bringing generally, if not invariably, the highest price of any apple, but a few exceptional varieties, in the foreign market. The tree is a most prolific, regular, and enduring bearer. But it does not bear, as a rule, until ten years of age, and does not come, until some four or five years subsequently, into full bearing. Its very productiveness is a source of trouble, for, unless well thinned out, many of the apples are small and worthless, and, for packing, the skin is tender, demanding careful handling.

Of the Baldwin, Mr. Beadle says :

"Taking all fruits into consideration, the varieties of winter apples most esteemed in our district are, first the Baldwin, which is head and shoulders above all the rest, and is more planted than any other variety."

He puts the Baldwin first for export, and, further on, he says : "The Baldwin is used both for cooking and dessert."

Mr. Dempsey bears a high testimony to its value as a shipping apple.

Mr. Arnold prizes it as a good keeper.

Mr. Westland puts the Baldwin second on the list for shipping purposes.

The Baldwin stands first on Mr. Dougall's list of favourite varieties.

It is among Mr. Pettit's choice winter apples.

Mr. Ball writes respecting it :

"The apple now most largely shipped to the old country, and yielding the best results to both grower and shipper, is the Baldwin. So much so that out of a lot of 4,500 barrels, sold in Glasgow on the 9th of November, 4,250 were Baldwins ; and out of another lot of 4,250, sold in Covent Garden on the 17th ult., only 285 were of other varieties."

Notwithstanding the tenderness of the tree, previously alluded to, the Baldwin ranks high in the estimation of nearly every other authority whose evidence is recorded.

The Rhode Island Greening appears to be the closest competitor of the Baldwin for popular favour.

Mr. Beadle, however, notices that it is, as a winter apple, a poor keeper, and would not ship it to Europe, but, instituting a comparison with other sorts, he says :

"The Rhode Island Greening is on the whole, for the country generally, the best cooking apple for home consumption and the home markets."

Mr. Dempsey, on the other hand, refers to it as in good demand for exportation ; and Mr. Allan says :

"Choice Northern Spy and Rhode Island Greening apples always command the highest prices. For the European market, colour is wanted, although Rhode

Island Greening and Green Newtown Pippin are readily purchased at high prices. One Glasgow firm, to whom one of our apple growers shipped an assortment of apples last year, wrote back asking for all the Rhode Island Greenings he could procure, in preference to other sorts."

Mr. Westland puts the Greening at the head of his shipping apple list. But it is to Chicago, rather than Europe, he looks for his foreign market.

Mr. Caldwell, of Waterloo, in whose opinion the Northern Spy is first of all winter apples, goes on to say :

"The next best apple is the Rhode Island Greening, for winter. It is both a fine dessert apple and a baking apple. It is also a good shipper."

The views expressed by some of the witnesses, as to the shipping qualities of the Rhode Island Greening, are not necessarily irreconcilable with those of Mr. Beadle. He speaks, it must be recollected, as a perfectly independent critic, as a nurseryman rather than an orchardist, and from the heart of a district where choice is practically unlimited. When, too, the Greening, which appears to pack well enough, is shipped to Chicago, or for early consumption to England, its demerits as an indifferent keeper are not so prominently brought into notice.

The *Æsopus Spitzenberg* would, as a matter of private taste, be first in the preference of Mr. Beadle, but a want of attractiveness in its appearance he admits, tells against its popularity with the public.

"It cannot," says Mr. McKenzie Ross, "be surpassed for eating quality."

From Mr. Caldwell's reference, already quoted, the *Æsopus* is clearly a well appreciated apple in the British market ; although, while giving it credit for hardiness, Mr. Hinman places it behind the King of Tomkins County and the Holland Pippin as a shipping apple. Mr. Roy recommends it for export. In the Perth report it is commended as a good keeping apple and this is endorsed by the reports from the United Counties and Middlesex.

The American Golden Russet is placed, by Mr. Beadle, second only to the Baldwin as a useful apple for either home use or export, but as a matter of choice, he classes it as a dessert apple,—the purpose for which it is chiefly suited,—a long way behind both the *Æsopus Spitzenberg* and the *Swayzie Pomme Grise*. It is commended by Mr. Dempsey, both as a hardy apple and a good keeper. Taking it altogether, the evidence establishes its reputation as an apple of good qualities in an economical sense.

The Roxbury Russet is a popular apple, and is said to be the "longest keeping apple of any generally planted." It probably ranks equal, or nearly equal, to the Golden Russet, as a shipping fruit.

The Swayzie Pomme Grise, a small but deliciously flavoured dessert apple, is not so well known as it deserves to be, for, among apples of its own class, it probably stands first. Its modest exterior, occasionally, and only where the sun has had full force exhibiting a little colour, may have something to do with the want of appreciation in its own country by which it has hitherto suffered. But in Europe its merits are well known. Mr. Leslie says of it:—

“The most popular apple for shipment is the Swayzie Pomme Grise, which is about the highest priced apple that has ever been shipped, about £5 a barrel being paid for it in Covent Garden market. The tree is an excellent grower, and will produce about three barrels of fruit a year when in full bearing. The Swayzie Pomme Grise is small and is used entirely for dessert purposes. In my opinion it is the best dessert apple in the world. The fruit is pretty, it is a perfect cinnamon russet, and, where exposed to the sun, takes on a very nice red cheek. Those specimens grown on the interior branches of the tree have no colour at all. The tree is one of the very hardiest, and in view of the demand for the fruit, it is one to which we might turn with good prospect of success. It is not largely cultivated at present; though it has been grown a long time it has not got into general cultivation for some reason. It is a Canadian tree, a native of the Niagara district, and is cultivated to some extent there.”

“Above all the rest of the winter varieties, for a dessert apple, says Mr. Beadle, “I place the Swayzie Pomme Grise.”

The Fameuse, or Snow Apple, is almost universally grown, and, says Mr. Beadle,—

“Has been popular and is popular still when we can get it in perfection, but during the last decade it has spotted so badly, almost every year, that we cannot do anything with it—cannot get it to market.”

It has been sometimes shipped as an early winter or late fall apple, but it is to its qualities as a fair keeper, a free grower, and its hardiness, it chiefly owes its reputation.

The Yellow Bellflower comes in for a less frequent share of notice than many of its contemporaries, although well spoken of when mentioned. Mr. Roy says:—

“In the Georgian Bay district I think there must have been from 3,000 to 4,000 barrels shipped from Owen Sound alone this year. I couldn't say where these have been shipped to. They all were the winter kinds I have mentioned. I shipped some of the Bellflower to Scotland, and they succeeded very well. I got \$3 a barrel for them here before they were shipped. They were all hand picked. I think they would fetch \$6 or \$7 on the other side.”

Of the King of Tomkins County, Mr. Beadle speaks with some reserve; but Mr. Hinman, of Grafton, ranks it ahead of the *Æsopus Spitzenberg* and the Rhode Island Greening, as a good shipping apple. It is one of the choice varieties

selected by Mr. Morris of Fonthill, on which to establish a reputation in the British market. In several reports it is mentioned as an apple that is successfully cultivated and well appreciated by the home consumers.

Of the Wagener, Mr. Beadle speaks as follows :

“As to its qualities as a winter apple it is not a long keeper, and must be used in the first half of the winter. So far as my observation goes, it has not been very largely planted in our section of the country. I have conversed with Michigan men who are trying it, and they like it ; but I find that after all it will not keep long enough to be very much sought after as a market apple, particularly for sending long distances. It would do very well for the home market or others near by, but it would not do to send across the Atlantic.”

Mr. Cady says of it :

“We do not care much for the Wagener, as with us it is a hard woody-fibred fruit, not very palatable, though it is hardy and stands shipping well.”

Mr. Cady's shipments would probably be to the Chicago market, which Mr. Beadle would class under the term “others near by.” But Mr. Arnold gives an item which seems to conflict more directly with Mr. Beadle's opinions. He says :

“For export, the Wagener comes first. A gentleman in Seaforth told me he got twenty-nine shillings (about \$7.25) for them in the old country market, when he got only nineteen shillings for the Northern Spy.”

The Newtown Pippin has for many years been an article of export from this side of the Atlantic to Great Britain. In Mr. Beadle's evidence he says :

“There is a variety of apple which can be grown on the Hudson River, called the Green Newtown Pippin, which commands a better price in England than any other American or Canadian apple. When it is ripe and well grown it is of a beautiful golden colour. . . . The Newtown Pippin has been sent from the Hudson to England for many years. Mr. Pell, the owner of one of the orchards, sends his whole crop to England. He packs them with the greatest care, rolling each apple in tissue paper, and putting them in small sized packages. He has succeeded in getting up a reputation for his apples.”

The attention to packing carefully, and shipping it in a tasteful manner has, probably, had not a little to do with the prices obtained in the past for the Newtown Pippin in Great Britain. Its popularity, however, has apparently been on the wane of late years, owing, no doubt, to increased competition and the intrusion of other choice varieties, but also to a fact mentioned by Mr. Arnold, that its name has been assumed for other apples, and either its reputation diminished or its identity lost. Mr. Arnold says :—

“The Newtown Pippin is an American apple which has almost gone out of fashion in England for several reasons. In the first place you scarcely find two men who agree as to which is the Newtown Pippin. Many are shipped to England under that name which are nothing but Greenings, and you will see the same confusion at all our exhibitions.”

Mr. Ball says of this apple :

“Although the Newtown Pippin brings by far the highest price in the English market, yet we have very few localities in which it can be grown sufficiently free from blemishes to render it worthy of cultivation for exportation.”

The Ribston Pippin is an old standing favourite with the English public. Mr. Arnold says of it :

“The Ribston Pippin is cultivated to suit the taste of the English, as it is a favourite apple there. Every Englishman, and most Scotchmen, think there is nothing like it. I think it enjoys rather a false popularity in those countries. It is not a first-class grower. It would of course be a profitable apple here if we had a market in England. We can grow far better Ribstons than they can in England, owing to our having a better climate. In some localities the Ribston Pippin is a shy bearer, though nothing like some other varieties. I have some half-dozen Ribston Pippins bearing, but they are youngish trees.”

Mr. Allan of Goderich, says of it :—

“I don't think there is any peculiarity in our district favourable to the Ribston Pippin. The tree requires very careful cultivation or the fruit will run out. It is a very popular apple in England, and it goes along with others to that country.”

He further remarks :—

“The Ribston Pippin succeeds well with us, and we consider it a profitable variety. It is well liked for family use.”

Mr. Beadle makes some practical suggestions with respect to this apple. He says :—

“We have beaten them (England) in their own market with the Ribston Pippin. It sells in England at £3 sterling, or \$15 a barrel. I could not give the cost of shipping a barrel of Ribston Pippins to England. That variety is not very largely grown on this side of the Atlantic. I am not aware that it has gone out of favour either here or in England. In order to have it sent there in season it must be shipped by steamer. The apples should be gathered not later than the first of September, as it should be in the market not later than the middle of October. It is still popular in England, and there is no reason why it should not be grown here as freely as in England.”

The Red Canada is spoken of by Mr. Dougall as “a fine apple, but slow in growing.” It is as a dessert apple, Mr. Dougall chiefly commends it. Mr. Cady, who says it is known in Michigan as Steele's Red Winter, and in Massachusetts as the Old Non-Such, gives it credit for good keeping qualities. Mr. Dempsey confirms this, and also mentions it as one of the apples most in demand for export.

The same gentleman “knows no apple to compare with the Ben Davis as a profitable market apple, if grown upon favourable localities and soil.” For retailing in Belleville, he says, “it brings the highest price of any apple we have.”

Mr. Beadle says of it:—

“The Ben Davis is a showy fruit . . . I do not think the Ben Davis is of as high a quality as the four I have named; still it will sell.”

Talman's Sweet, or Sweeting, is mentioned in the reports from three counties, more particularly as a good keeping apple. Its popularity appears to be greatest in the eastern districts.

Mr. Arnold suggests Grimes' Golden as an apple likely to command favour in Great Britain. Mr. Beadle says of it:

‘It is a most beautiful apple and the tree bears well. It is in the best condition about the first of December. Then it is excellent.’

Apropos of the shipping trade in apples, Mr. Ball remarks:—

“The Spy, Spitzenberg, King of Tomkins County, or any good, sound variety will sell, preference being given to high-coloured varieties, other qualities being equal. The American Golden Russet and Pomme Grise do well, but the Rox Russet should be kept for spring shipping.”

Dates of Bearing and Maturing.

The periods from the graft occupied by some of the leading varieties of apples before bearing fruit and in coming to maturity, are, approximately, as follow:—

NAME.	Years before bearing.	At Full Maturity. Years.
The Wagener	3 — 5	10
The Fameuse.....	5 — 7	12
The Baldwin	6 — 7	12
The R. I. Greening.....	6 — 7	12
Grime's Golden.....	6 — 7	11 — 12
American Golden Russet	6 — 7	12 — 13
Roxbury Russet.....	6 — 7	12 — 13
Swazie Pomme Grise	6 — 7	12 — 13
Newtown Pippin	6 — 7	12 — 13
Red Canada	6 — 7	12 — 13
Yellow Bellflower	6 — 7	12 — 13
Ben Davis ...	6 — 8	12 — 13
Talman's Sweet	6 — 8	12 — 13
King of Tomkins County	7 — 8	12 — 13
Æsopus Spitzenberg	8 — 9	14
Northern Spy ...	10 — 11	15 — 16

Crab Apples.

The leading varieties of Crabs grow in every part of the Province and yield very large crops. At Arnprior, and in Muskoka, as well as in the front counties, the Siberian, Transcendant, and Montreal Beauty were found to be equally prolific. The Siberian begins to yield fruit in four years after its removal from the nursery, and bears a profitable crop in six. The others are also early bearers.

Cultivation of Apples—The Soil.

Some notice of the evidence as to the best methods of cultivating apples will now be interesting.

The tree may be suffered to begin its orchard life at four, in some cases five, and in others three years from the graft. Some will in four years from transplanting yield a fair average crop. "Very much will depend," remarks Mr. Beadle, "on the way they are treated after planting in the orchard."

"Apples," the same witness remarks, "will succeed in any soil, so far as the surface is concerned, but they require a well-drained subsoil. A porous subsoil is essential; they will not thrive in a cold, wet subsoil coming at all near the surface. . . . Where the subsoil is unfavourable for the growth of apples, draining should be resorted to. . . . Given an orchard upon an unfavourable soil, and the proportion of increase, which would be the result from proper drainage, would amount to all the difference between profit and loss. Just for the time being it would probably make no difference in the yield except that an orchard on unfavourable soil would gradually go down, while the one on favourable soil, properly drained, would go on increasing in value."

Mr. Dempsey remarks on the same point:—

"Trees are no longer lived if planted on a sandy porous soil than on any other soil. My opinion upon that point has been formed from observing the wild trees of the forest. There is a great deal of that kind of soil in Northumberland, on rolling white oak ridges, and wherever the apple tree has been planted there it flourishes. I am planting on similar soil, though it is a little heavier. . . . We have planted trees on soil that we were told would not bring a good crop of rye. It had been cropped with rye and buckwheat for forty years, and had grown up with a small undergrowth after a bad clearing. We cleared it off and cultivated it thoroughly, and got a fine growth. . . . It is only a few of the very hardy varieties that will succeed on low land, while on light porous soil the tree matures its growth early in the season, and is prepared for the winter. We cannot drain damp soil sufficiently to grow the tender varieties. The difference consists in the fact that on the light soil the wood ripens early in the season. The soil I refer to, I would call a sandy loam, though it varies in spots. Some spots in the orchard near us, where, as I mentioned, the Northern Spy is flourishing, are drifted sand. Upon our land the drifting sand gradually changes to a slightly heavier soil, like loam, until it runs into a clay loam, where the trees do not flourish so well as upon the sand—particularly some varieties."

"Sandy loam or gravel, with a porous sub-soil," says Mr. Westland, "is the best soil for apple growing. I think it is important that the sub-soil should be sufficiently porous to be well drained. I think a southerly aspect is the best for an orchard."

Natural or artificial under-draining must therefore be considered the first condition of successful and profitable apple culture.

Mr. Arnold says on the same subject:—

“For an apple orchard, I prefer a soil that is neither too strong a clay nor too light a sand, with, if possible, a mixture of limestone; the soil to be well drained. As to the difference between clay soil and sandy soil I find that those who live on a clayey soil call everybody else’s sand and *vice versa*. I like a sufficient amount of sand so that it will not bake like brick, and enough clay so that the moisture will not leach through.”

Height and Form of Trees.

“The best kind of a tree,” says Mr. Leslie, “is a half standard, that is a tree with a low stem, say about three feet high.”

Mr. David Caldwell, of Waterloo, says:

“I find that a tree with a low stem comes into fruit sooner than one with a high stem, and then if you wish to barrel your fruit for exportation you can take it off the tree with your hands and handle it as carefully as you would eggs, which you would not be able to do if the stem was high.”

Mr. Morris of Fonthill, says on this point:—

“To make the growing of orchards a success I would advise planting trees about three years old, and what would be called ‘half standards.’ An apple tree with a three feet stem would be a half standard, that is, branching out at a height of three feet from the ground. It is against nature to grow a tree with a bare stem, exposed to the sun and weather; it tends to make the tree diseased. If the limbs are allowed to shade the trunk the tree is always healthy and free from borers, and it tightens the bark. I would start with a low trunk. I know a tree will grow in proportion to the lowness of the stem. The shorter the stem the faster the tree will grow. I have demonstrated this. Another advantage is this, that you can step into the tree and gather the fruit, and at the same time if the first limbs are brought up you can work with a team as well as among tall stem trees”

Aspect—Windbreaks.

All the authorities agree that, for an apple orchard, a southerly aspect is desirable, and that where no natural protection exists, the orchard should be protected from the north and west by a belt of evergreens, which will at one and the same time secure it from an annually recurring danger, and add much to its beauty.

Mr. Dougall says on this point:—

“I advise the planting of a belt of evergreens for the protection of orchards. Deciduous trees do not protect them very well in the winter, because of the absence of leaves. I think a row of trees would be very little use. I would have a belt of young trees of some width, and they should be planted on the sides from which the coldest winds come. As the country gets cleared up trees are needed more and more every year. In Lower Canada they used to raise apples and pears well,

before the country was cleared off, but they have left wide strips of trees in such a shape along concession lines that the wind sweeps through between them as it would through a large funnel. If I were going into orchard planting I would plant a belt of trees the first thing on all sides except, perhaps, the south-east and south-west. I think that is indispensable unless in parts of the country where there are plenty of woods."

Planting Out.

"The trees in our district," says Mr. Beadle, "are planted thirty feet apart; some plant them thirty-three and a half feet apart."

He adds the remark that, where the soil and climate are favourable, many orchardists will intersperse the young apple trees with peach trees, the peach being earlier in maturing, and much shorter-lived than the apple, thus giving a return to the orchardist, while the apple trees are coming into bearing.

With some little variation as to their modes of expression there is a general consensus of opinion among the witnesses as to the distance apart at which apple trees should be planted.

Cultivation of Soil.

On the question whether, or rather how long, the soil of an orchard should be kept under cultivation, some differences of opinion exist. Mr. Beadle says:—

"While trees are growing, and before they have obtained their full size, I think it is best to cultivate the ground under the trees and keep it loose. This cultivation should continue until the tree has attained mature size, which will perhaps be on an average five or six years. After that, the orchard may be safely seeded down. If there is to be any value obtained from the grass by grazing, it would require to be broken up occasionally and re-seeded, but I don't know that I should attempt to do it. I think I should let the grass take care of itself. In cultivating the ground before seeding it down I should plant it with potatoes, beans, beets, or hoed crops of any kind. I have grown Indian corn in an orchard, but I took good care to have food enough for the trees and for the corn too. I am strongly of opinion that sowing of any grain crops, such as oats, barley, wheat or rye, is especially detrimental to a young orchard. I have seen young orchards of two years' planting ruined by a crop of rye, because the rye absorbed the moisture which the trees required, and they literally died of drought."

Mr. Dempsey, on the other hand, says:—

"The most successful orchards I have observed have been cultivated constantly without being seeded down. . . . If an orchard is constantly cultivated, but cultivated shallow, the roots of the trees are not disturbed, but by allowing it to run to seed the small roots seem to be encouraged to the surface. Ploughing certainly destroys a number of the roots and checks the growth of the tree, but this is rendered unnecessary by frequent shallow cultivation."

Mr. Arnold would adopt a discretionary policy, varying somewhat with circumstances. He says:—

"In the cultivation of apple orchards a considerable amount of common sense

and judgment is required. If the orchard is growing too fast I allow the grass to grow around, and when it is growing too slow I immediately dig it up and manure it well. I should be sorry to plant a new orchard without keeping the ground cultivated for four or five years at least. After that the treatment would depend on circumstances, such as the depth, strength, and richness of the soil, how soon I would let it get into grass again. I know an orchard remaining in permanent grass for a dry season proves death to many apple trees, because they cease growing in summer time when they should grow, and when the fall rains come on they make a start too late in the fall for the wood to ripen and the trees are badly injured."

Mr. Allan, of Goderich, says:—

"I believe as truly in cultivating for fruit as I do for corn, wheat, or other grain, and it is profitable to do so until the orchard becomes old, when it is difficult. Even then, the soil can be worked around the trees and manure applied in liberal doses. The only reason I would have for seeding down, even temporarily, would be, that the trees were running to wood too much."

Mr. Roy says:—

"I prefer to cultivate the ground of the orchard until the trees are seven or eight years of age, and then you may seed it down. After trees have reached that age I would not do much at cultivation. I don't see how you can cultivate after the trees are eight years old as they begin to grow close together. I planted my trees eighteen years ago thirty feet apart, and they are always meeting. It is almost impossible to cultivate when trees meet."

Mr. Dempsey also adds the following item of information to his remarks, already quoted:—

"A gentleman of my acquaintance, Mr. John P. Williams, has adopted a system of cultivation, which I think is worthy of notice. He cultivates in the spring until about this season (June), ploughs his land twice and sows it with oats; when they are about four or five inches high he buys a lot of sheep, turns them on the land, they live on growing oats during the summer, manuring the land, lying under the shade of the trees, and devouring falling fruit. The sheep do not do any injury, and his orchards are flourishing under that system. Young trees might be injured, perhaps, but this was an old orchard of rough bark trees."

All the witnesses agree in advocating the careful cultivation of the orchard for some years, and most of them that nothing more exhausting or more closely grown than a hoed crop should be planted. "Common sense and judgment," as Mr. Arnold says, must be the guides of the orchardist after the trees have attained a mature growth. The use of orchard ground for sheep pasture, a green crop being sown annually, has the threefold value of being a source of cultivation, economy and recuperation. But it is obvious that only into an old orchard would the introduction of sheep be possible. The remark made conversationally by one of the witnesses in this department of inquiry, to the effect that he thought "one crop at a time was all anybody had a right to expect from his land" had a good deal of force in it. The object of the orchardist should be, before everything, to make the orchard a success in itself, and any other crop should be subsidiary to that grand object. Niggardliness and a false economy are as fatal to really successful fruit growing as anything else.

The Shipping Trade in Apples.

The shipping trade in apples, particularly to Great Britain, has rapidly grown, in the last ten or eleven years, to dimensions of considerable importance. The Trade and Navigation returns, unfortunately, do not discriminate between varieties of fruits, the general heading "Green Fruits," in the tables of exports, covering green fruits of all classes. But it may be taken for granted that the terms "apples" and "green fruits" are in this case nearly identical, for the amount of green fruits, other than apples, exported is insignificant. A reference to the Trade and Navigation returns shows what, in the period above mentioned, the progress in this direction has been. In 1868-9 the total exports of green fruits from Canada to all countries, was but \$30,150 in value. To that volume of exports, Ontario contributed \$11,948 all to the States, and Quebec, nominally, \$11,686, of which \$8,654 went to Great Britain and \$1,703 to the States, the balance being shipped to other countries. The term "nominally" is used in connection with exports from the Province of Quebec, because it is too obvious a fact to be disputed, that, while a large portion of all the products of Ontario are shipped from, and entered as shipped from Montreal or Quebec, in the case of fruit, Ontario is practically the one fruit growing and exporting Province of the Dominion. In 1879-80 the total exports of green fruits from Canada were in value \$173,870, of which \$140,231 went to Great Britain, and \$22,202 to the States. In 1879-80 the exports of green fruits were in value no less than \$364,390, or just about twelve times the amount of the exports in 1868-9. Of the total volume in 1879-80, \$303,313 went to Great Britain, and \$50,404 to the States. The exports credited to Ontario and Quebec in 1879-80 amount to \$288,733, but as the exportation of apples is proceeding late in the year, or even through the whole winter, a considerable amount finds its outlet by way of Halifax, some of which may be credited in the returns to Nova Scotia, although really from Ontario. Only by the aid of properly collected annual statistics can full justice be done to the Province of Ontario in this respect.

Of this growing trade, Mr. Ball, whose letter has already been quoted from, writes as follows:

"The apple trade with the old country is fast settling down on a permanent basis. Ten years ago it was in its infancy. In 1870 only 2,000 barrels went to Glasgow, and a lot I sent that year averaged \$7.60 per barrel gross. Since that time it has rapidly developed; for several years, each year has doubled the exportations of the past one. The taste for apples from this side has grown, until they are now as much a necessity as our wheat, and beef; for this reason, it has now assumed the aspect of a regular trade, and is not so much a speculation as it once was. So that prices will not run into extremes, as in former years, but a sound, legitimate trade has been established, governed like all others by the law of supply and demand. The English and Continental apples do not influence the price of our apples, as we have driven them almost entirely out of the market in all the large cities, the local fruit only supplying the local demands. The magnitude of

the trade has caused our ship owners to compete for the carriage of it, and better rates for shippers have been obtained this year. Another feature has been developed during the past season, and that is, buyers from Britain have competed with our own in the large centres of trade, like Toronto and Montreal, while comparatively very few have visited the fruit districts of Ontario, for the purpose of buying orchards, preferring to have growers pack and ship their own fruit."

Mr. Beadle, in his evidence referring to the same point, says :—

"There is no reason whatever why Canada should be second as an apple growing country to any country I am acquainted with. We have better apples than they have in England or can possibly grow there. I would give the preference to Canada in comparison with England as an apple growing country, having regard also to the cost of raising. There is nothing to prevent our apples from competing successfully with the English apples in England, if they are properly sent."

We must not, however, pretend that we have yet attained to perfection or discovered the apple that will bring the highest conceivable figure. For the bulk of our trade we must rely on such staple varieties as we have noticed above, but there are always people in Great Britain who will pay almost any price for what is exceptionally choice and excellent or attractively presented. To the production of such an apple and its presentation to the consumer, in the most inviting form possible, our fruit growers will do well to continue perseveringly to address themselves. Meantime, in order to sustain the position we have already gained, a jealous regard for the reputation of themselves and their products should influence every exporter.

Picking and Packing.

The care to be observed must begin in the orchard. Mr. John Graham gives some good advice as to the picking and selection of the fruit. He says :—

"If apples are to be packed in the orchard we would advise (as has been practised by some), that a tent be put up (to shade the apples from the sun), with a table under it; nail three or four inch strips on the sides and ends to prevent the apples from rolling off, cover it with woollen cloth, so that the pickers may empty their baskets without injuring the fruit; let the packers select the fruit, rejecting every one that is under size, spotted, wormy, or deformed in any way; let the fruit be of a fair uniform size, as it will not pay to send them in any other shape to a foreign market. Don't be tempted to snip medium and large apples in the same barrel. Ship medium-sized in barrels by themselves. Pick the apples from the trees; lay them down, don't throw them the whole length of the arm into the basket so that they will rattle against each other; empty them carefully upon the table for selection; put the large by themselves; the medium by themselves, and the culls by themselves."

Mr. Beadle says, in connection with the same matter :—

"Great care should be exercised in packing apples for the foreign market, and unless that care is taken the result is almost always loss. A great many have shipped from our section of the country to the foreign market and have reported

to me that the speculation was a loss, but when I came to inquire I found that there was a very good reason—they were not packed and selected with care. In the first place you should pick out prime apples, all well-grown specimens. When I say well grown I do not mean extra size by any means, but that they are the fully developed size of that variety. Then they must be free from imperfections, such as cuts or bruises, spots or scabs. They must be packed carefully, not handled roughly, but put into the barrel with care, gently shaken when the barrel is full, and when the top is put on they should be pressed a little. I have seen some apples piled up and the top pressed down so that the cider ran out; that may do for the home market, but for the foreign market there must only be a little pressure. If you want to send an extra sample and get an extra price, you must wrap each apple in tissue paper, and line your barrels at bottom and sides with coloured tissue paper, press them down a little, and, perhaps, instead of rounding the top up with apples, put in a quantity of some soft material. Some recommend packing with buckwheat chaff, but anything will do that will keep the apples from shaking when the barrels are moved about. Apples put up in that way command a much higher price that will pay well for the trouble.”

Mr. Ball, too, writes :—

“In shipping to Britain, or any where else, only good tight barrels should be used, from the fact, that no matter how much you may sweat apples, the process of evaporation still goes on, unless the air in the barrels is saturated with moisture. And the escape of this moisture is the cause of so many ‘slacks’ that often so sadly reduce the proceeds of the lot. In selecting let the apples in the barrel be of a uniform quality throughout, and the whole contents be fairly represented by the top layer. Facing the barrel is so generally done that not to do it would seem to indicate carelessness or want of experience in putting up fruit; but should any one intend to follow the business, and do it fairly, I would not think it necessary, as the brand would always sell the fruit for the market value.

“In packing, use baskets to fill the barrel, holding not more than one half-bushel, lesser ones the better, and to every basket put in, give the barrel a good shaking, looking sharp for any imperfect fruit, as the best sorters will sometimes let a bad one slip in; fill to about the top of the barrel, but do not round or heap it up, press the head in, which will contract the barrel about one and one half-inches, and if every apple has found its bed by thorough shaking, the barrel will roll as if it were a solid piece of wood. The hoops should be nailed before the barrel is filled, and if the points should project, they should be broken off. The heads should be lined.

“It is a great mistake to fill the barrel so full, or rather to heap it so high, that the apples are crushed in putting the head in. In this case the texture of the flesh is broken and the fruit will either dry or rot, producing a shrinkage that will cause the apples to rattle when the barrel is moved. All such on landing are placed on the catalogue as ‘slack,’ and on an average only bring about half price. On the other hand, when the pressure is equal to the elasticity of the apple, but not enough to break the flesh, a good tight packing is secured.”

Mr. Allan, of Goderich, recommends the Tomlinson barrel, which he thus describes :—

“It is made in the form of a cylinder, without any bulge in the centre; it is cut in one piece from elm logs, similar to the common cheese boxes. The piece (or shaving) can be put together double and joined at the sides by splice and nailed well. These barrels are often used for oils and vinegar. At the top and bottom good-sized hoops could be placed upon which the barrels could be rolled in ship-

ping, thus saving the body of the barrel from any pressure. These barrels, I am told, can be manufactured in quantities fully as cheaply as the common sort."

Co-operation in Shipping Apples.

Already in Great Britain, Canadian apples, as we have seen, enjoy a good reputation. But selfishness and greed will often put in peril the most promising trade. To guard against this some of our orchardists are adopting a co-operative method of guaranteeing their fruit to the consumer.

Mr. John Graham thus describes the object and plan of such an association in the Bay of Quinte district. He says :—

"With respect to the object we had in view in forming a Fruit Shipping Company; in the first place, we expect to reap the benefit of each other's experience in growing and shipping fruit, and as all of us have young orchards beginning to bear more fruit than we can profitably dispose of in our local markets, we expect, by careful picking, selecting, and packing, to establish a character as fruit growers that will enable us to compete in the foreign markets with the best fruit growers of the continent.

"I might just say that our company has not existed long enough for me to say much from experience, but I consider we have gained fifty per cent. from what few transactions we have had in shipping fruit. In shipping it is required of each member that he puts his initials on the head of each barrel and his card inside. The commission merchant to whom we consign is instructed to sell the fruit of each brand on its own merits and make his report accordingly, so that each one receives his just due according to the value of his fruit. So you see that, as the buyers in a foreign market get accustomed to the marks, if we have a 'black sheep' in the flock he will eventually weed himself out, but we do not intend to admit any person who has not first established a character as an honest, upright packer. By careful selection, and careful, honest packing, I do not see why we should not anticipate a bright future."

Market Prices of Apples.

The price of winter apples in Canada does not generally exceed from \$1 to \$1.50 per barrel; about \$1.25 is a fair average, but during the past season these figures have been, in some cases, barely maintained. While the Commissioners were sitting in Cobourg, Mr. Hinman, one of the witnesses, was disposing of his crop at sixty cents to persons who found the barrels and packed the fruit, Mr. Hinman boarding them while so engaged.

Mr. Ball says of the prices in Great Britain :—

"The price this season has ranged from 12s. to 20s. sterling (say \$5) per barrel—some few lots lower and some higher than these figures, but I think 14s. sterling (say \$3.50) a low average per barrel, and this will be about the range for ordinary years for some time to come."

If only the fatal errors of careless picking and packing be avoided, the export trade can hardly fail to be remunerative.

A New Drying Process.

The disposal of the surplus summer and fall apples now often left to rot on the ground or fed to stock, has been a question of difficulty. But, for some time past a system of bleaching and drying apples by an artificial process has been in operation in the States, and it is satisfactory to know it has now been introduced into Ontario. Mr. A. M. Smith, of St. Catharines, thus described the method and apparatus used:—

“A fruit drying establishment has recently been started in St. Catharines with a capacity to dry 150 bushels of apples a day. . . . This industry is something new to Canada, but not to the States. The apparatus used is called the ‘Scientific,’ and is an improvement on the ‘Alden,’ although the principle in the two is the same. It is an upright frame or box built over a furnace, and on each side there is a belting like a straw carrier. As the fruit rises on the slats it is subjected to the hot air of the furnace. The temperature required is from 160° to 170°. The fruit comes out all dried. Before being put in the dryer the fruit goes through a process of bleaching to make it white. That was formerly a secret process, and people wondered how the fruit was rendered so white. The fruit is bleached with sulphur, being put on little trays which are placed over burning sulphur, and allowed to remain there a short time. They have machinery to cut up the fruit. These parers are worked by women and girls. One girl pares the fruit; another cuts it into sections, and takes out the bruises and bad pieces. I think each tray is allowed to remain over the sulphur when bleaching for about five minutes. The bleaching is done as soon as the apple is cut. Before the apples go through the drying process you can taste the sulphur, but not after they have been dried. After the fruit is dried it is packed in fifty-pound boxes. They intend to ship the apples from the St. Catharines’ factory to England. I have seen several of these drying establishments in the States.

“I have heard it stated that the apples can be cut and prepared for drying for 6 cents a bushel, and the proprietors only pay 15 cents a bushel for the fruit. About five bushels of apples make a bushel of the dried fruit, which weighs twenty-two pounds. At Lockport they sold the dried fruit last year for 12 and 13 cents a pound, while ordinary dried apples bring only 4 or 5 cents. I don’t know what the price is this year. For drying, the best apples of course are not used. It would not pay to dry and ship the best quality of winter apple, but it would to dry the second-class ones.”

Mr. Hinman, who, with others, has purchased a drying machine, adds the following information respecting it:—

“We can get one bushel of dried apples, or 22 pounds, from 4 or 4½ bushels of green ones. The usual price of dried apples is 7 cents per pound; but at present they are only 5 cents. We purpose sending them where they will command readily about 20 cents per pound. At present there are waggon loads of apples of certain varieties rotting on the fields, as we cannot sell them. Any kind of sound apples can be utilized by the drying machine.”

Preservation in Winter.

For wintering apples a cool cellar is necessary. The fruit will bear a few degrees of frost without injury, and the nearer the thermometer is to the freezing

point the better. A cellar suitable for roots and vegetables would be usually too warm for the apple. Some growers prefer to keep the apples on shelves, in order to allow of the separation of any spoiled fruit, but the most approved method is to pack them in barrels, as described by Mr. Ball, and store them in that condition until wanted. The temperature and dryness of the atmosphere are eminently favourable to the preservation of the fruit in this country. In Great Britain, on the other hand, the sooner the fruit goes into consumption the better.

Pruning and Training Apple Trees.

It is not possible in this report to go into all the minutiae of orchard management, nor, having regard to the fact that these notes are intended for the farmer who may devote a few acres to fruit-growing, and not for the professional culturist, is it necessary to do so here. But, on the subject of pruning and training apple trees, a little information will not be out of place. When asked what time he recommended for pruning his trees, a blunt-spoken witness replied: "whenever the knife is sharp enough!" His meaning was explained to be that, whenever the tree in appearance or vigour could be improved by the application of the knife, it should be applied. "Prune well but never severely," may be regarded as a safe maxim for orchardists. As a rule, farm orchards are not pruned sufficiently, and the cultivation of wood largely supplants that of fruit in many. Mr. Beadle's advice as to pruning is as follows:—

"I like to prune an apple tree into a sort of inverted umbrella shape as nearly as may be, having some reference of course to the habits of the tree. Sometimes, however, I make a second story of limbs—a small set in the centre. I don't think, however, that the form is so very essential so long as we keep the top sufficiently thinned out to allow a free circulation of air, and enough of the sun's warmth to come to the leaves. We should guard against allowing the tree to become too dense, so that the fruit is not sufficiently exposed to the sunlight and air—perhaps mostly the air, because I believe the fruit needs but little sunlight. The leaves are the organs that develop the sap both for the fruit and the tree. We should also guard against exposing the bare horizontal branches to the direct rays of the sun, because sometimes the heat is sufficient to scald the bark when so exposed. The only object I have in pruning an orchard tree is to get in a circulation of the air and let in the light. The cup form of tree is probably not so important here as in Great Britain. In Britain the sky is overcast much more in summer than with us, and there is proportionately less sunlight."

Mr. Dempsey says:—

"I have paid some attention to the form of apple trees. I have amused myself by training them in cordons, by grafting the ends together, and also in pyramids, and almost every other imaginable shape, by adopting the system of root pruning, but there is nothing pays so well in apple culture as a nice round head, not thinned out too much. I try to get them in umbrella form."

Mr. Morris, whose remarks, like those of the witnesses above quoted, will apply to other fruit trees as well as the apple, says:—

"I would train a tree to a flat, spreading head, and keep them from running

up. Try to make it spread out. I would start three feet from the ground and allow it to branch, and turn my side branches up to allow of horse culture underneath; above that the tree should spread out as much as possible. These remarks refer more to apple trees. I would not care to have pear trees with more than a foot or two of stem, and the same way with peach trees. I would favour growing them without any stem at all. I think cherries should be grown without a stem too."

Apple Blight.

Besides the dangers and injury to which the apple is subjected from birds and insects, to whose operations and habits a chapter will be specially devoted, the apple blight is the only trouble that appears to affect this tree. The cause, and the nature of this disease except so far as the effects are concerned, are little understood.

Mr. Beadle, says of it:—

"At times the apple trees suffer from a blight at the ends of the shoots. We had a period of it a few years ago, when it seemed to go like an epidemic through the district, blighting the ends of the twigs and blossoms just as they were forming into fruit. It very materially affected the crop that year, but it seems to have passed away. I noticed it this year again in the County of Welland, around Drummondville. But what appeared singular to me was that the trees which had no fruit upon them were almost entirely exempt from it—or at least were affected very slightly in comparison with the others. The blight, however, has never been so serious as to make it a matter of alarm to the orchardists."

Mr. Dempsey speaks of a similar visitation which attacked the apples just forming, and caused them to turn black; the blight was communicated to the pears, and pear blight developed itself.

Mr. Arnold speaks of the blight as "slight" in his district and "not serious."

Mr. Allan says:—

"We have had some attacks of the blight, but they have been very slight. The Transcendant Crab, and the Keswick Codlin are the varieties most subject to it with us, the trees, in some instances, being almost killed out in one season. Twig blight is very common this season on many varieties, but does not extend beyond the extreme ends of the new wood, taking about six inches of that."

It is evident that, in the opinion of these experienced culturists, the apple blight is no serious impediment to successful apple growing.

CULTIVATION OF THE PEAR.

Limitation by Climate.

The pear is not indigenous to Canada, and, whilst it attains in many cases a degree of excellence nearly approaching perfection, it can be successfully cultivated, as compared with the apple, over only a limited area. Its natural home

must be found in the Niagara and South-western Peninsulas; in the Huron fruit tract; on the Georgian Bay; in Prince Edward County, and along a somewhat narrow strip on the north shore of Lake Ontario, as far, perhaps, as the head of the Bay of Quinte. East or north of these places pears may be, and in a few cases are grown in the Province, but hardly for any marketable purposes.

The American or Fire Blight.

Another check to pear culture is the disease known as the American, or Fire Blight, to which the pears on this Continent are continually subject, and which is apparently, if not unknown, seldom observed in Europe. Its source or cause, as well as an effective remedy, are as yet undiscovered, for it has baffled all the study, and efforts for its prevention or cure, of fruit culturists and naturalists, both in Canada and the United States. Mr. Beadle says of this unwelcome attendant upon pear culture in Ontario, and in fact the whole of this Continent:—

“We have a disease here known in Europe as the American Blight, we call it the Fire Blight. The term has been so long used by fruit culturists that we know what we mean by it, but after all the word only expresses our ignorance, for we don't know what it is nor what causes it. It usually makes its appearance in July, and from that on to the end of the summer. It sometimes first appears in the end shoots of a summer's growth. They are noticed to become black, and they dry up. Sometimes this blight will only extend to the growth of the present season; at other times it will take two or three years' growth; occasionally it will appear on the trunk of the tree, and when it does it is usually death to the whole tree. . . . There is a disease which appears on the quince and Siberian crab so analogous to the one I have described, that it seems to be one and the same disease. The disease is not wholly unknown in England and the Channel Islands, because they speak of it there as the American blight, yet I presume it is seen there only to a limited extent. The liability to this blight seriously impairs the whole of America as a pear growing country. We are not particularly liable to it as a disease in Canada. My impression is that it has not appeared in the Channel Islands sufficiently to make it a source of serious trouble. As to districts near the sea, I am not sufficiently acquainted with them to give a decided opinion; but I should say that, where the climate is such that pear trees can be grown, they would not be so likely to be troubled with the blight as we are, because I know that in the vicinity of Boston there is a small section of country nearly or quite exempt from it. The climate of that section is more humid than ours, that is about the only difference.”

Mr. Dempsey stated that, for ten years, his trees had not been affected with the blight. Previously, for two years, they had been blighted. He suggests that having ceased to cultivate his pear orchard has had something to do with the cessation of the trouble.

Mr. Arnold says of it:—

“I have no theory as to the cause of the blight. I have sometimes thought that blight was much like apoplexy in the animal. The blight generally comes on my orchard after a severe or sudden change, such as a heavy wind, which knocks the branches together and breaks the sap vessels. I am satisfied that

high food is also one cause of it. Pears which grow slowly, in a moderately rich soil, are not so subject to it as those which grow in very rich soil. Many of the English trees are very unhealthy. Sometimes the trees recover from blight, and sometimes they do not. Some varieties are subject to be killed."

This view rather bears out Mr. Dempsey's theory, that the absence of cultivation, with its stimulating effects, has checked the tendency to blight.

Mr. Allan says of the blight:—

"We had some pear blight some years ago, and in some sections it is very bad now. The use of the knife is supposed to be the only reliable remedy, though it is claimed by some that blight can be prevented by using linseed oil as a wash, and well mulching the trees in summer and winter—light in summer, and heavy in winter to prevent the frost affecting the roots. Several orchards in which this is practised have never been troubled with the blight."

Mr. Cady considers that a light sandy and porous soil is more conducive to blight than clay loam or clay.

Mr. Dougall, of Windsor, contributes an item from his long experience on this point. He says:—

"I am not able to give you any cause for the blight attacking the trees. Sometimes one tree is affected and sometimes another, and sometimes a tree that is attacked this year will escape the next. I used to think that some varieties were proof against it, but a few years after they were attacked. The leaves and the young shoots get black, and they should be cut off about a foot below the diseased part. When you come into an orchard in the early morning, where the trees are suffering from blight, the smell is something like the smell of a field of diseased potatoes. I wrote to Charles Downing, the great pomologist, and he said the blight came periodically—once in twelve or fifteen years—but he could not account for it."

Mr. Morris, of Fonthill, is taking preventive measures, although he does not say whether they have been thoroughly successful. His recipe is as follows:—

"Some of my varieties have suffered from pear blight. I am interested in a three-acre pear orchard, but there has been no blight in it yet. For preventive measures we are washing the trees with sulphur and lime. We mix up a pailful of lime and throw in about a half of pound of sulphur, and apply that mixture to the trees. A considerable number of my neighbours have suffered from blight. Another plan I adopt to prevent blight is, to allow the limbs to grow right from the ground. I think one cause of injury to pears is letting them have long naked stems. You often see a dead spot at the bottom of the trunk due to that cause, although mostly attributed to blight."

Enough has been said therefore to show, first, that the blight is an ever present danger; secondly, that no actual remedy has yet been found for it; and thirdly, that there is most ample room for experiment as to the means of combatting or preventing it.

Ancient Seedlings

It is a curious fact that, notwithstanding the usual susceptibility of the pear to blight, there are some pear tree that are never known to suffer from it.

These are old seedlings, planted, or the immediate progeny of trees planted, by early settlers or missionaries, either in the French settlements in Essex, where colonies were established nearly 200 years ago, or, as at Fitzroy Harbour on the Ottawa, on the route of voyageurs of the same race. The originals came, probably, from France, and the existing trees are not now recognized as of any known European variety. Some of them are believed to be 60 or from that to 100 years old. Yet they often yield from 25 to 30 bushels of fruit in one season. It has to be shaken off the trees, and sells for one dollar a bushel. One person was mentioned by a witness who has made from \$15 to \$20 a year for 20 years from one of those hardy and prolific seedlings. Attempts to propagate them by grafting have not succeeded. They must be propagated by sucker- of which they throw out an abundance. Their propagation by any means would be decidedly advantageous and should not be lost sight of.

Varieties of Pears.

Of pears the varieties are very numerous, one witness, Mr. Mackenzie Ross, mentioning that he had no less than 85 in his nursery.

The pears named in the evidence, irrespective of seedlings, are 42 in number. As in the case of apples, local nomenclature may here and there produce a little confusion, and differences of climate interfere with the classification, but this is not the case to any considerable extent. The following is the list:—

Summer Varieties.

Rosticzer,	Manning's Elizabeth,
Osband's Summer,	Elliot's Early,
Beurre Giffard,	Doyenne D'Eté,
Windsor Belle,	Supreme de Quimper,
Bloodgood,	Ananas D'Eté,
Clapp's Favourite.	Tyson,
Bartlett.	Souvenir du Congress.

Fall Varieties.

Belle Lucrative,	Beurre Bosc,
Beurre Hardy,	White Doyenne,
Beurre Superfin,	Grey Doyenne.
Buffum,	Doyenne du Comice,
Onondaga,	Louise Bonne de Jersey,
Goodale,	Graslin,
Howell,	Seckel,
Flemish Beauty,	Duchesse d'Angouleme.
Sheldon,	

Winter Varieties.

Beurre d'Anjou,	Oswego Beurre,
Beurre Clairgeau,	Winter Nelis,
Lawrence,	Josephine de Malines,
Beurre d'Arenberg,	Vicar of Winkfield,
Beurre Diel,	President Drouard,
Beurre Easter,	

Description and Economic Merits.

Of the summer varieties, the Rostiezer is commended by Mr. Beadle as "a small early pear, but a good one for its size."

Mr. Dempsey ranks it second or third on the list of summer pears.

It is mentioned by Mr. John Graham as one of the varieties that escaped blight when his orchards were visited by that enemy last spring.

Osband's Summer Pear is placed by Mr. Beadle as next to the Rostiezer; on an equality with it by Mr. Dempsey; and mentioned as one of the most esteemed pears by Mr. Allan.

The Beurre Giffard, Mr. Beadle commends, as "a summer pear of good quality," and adds, "I would place it side by side with the Osband's in point of flavour." It is one of the pears recommended by Mr. Leslie in his evidence, and also by Mr. Dougall as one of the "best varieties." With Mr. Dempsey it does not succeed well.

The Windsor Belle is, according to Mr. Beadle, large and very profitable for market, but a pear he will not grow and does not want to eat. "It will realize more money in the market than any other in its season," he says, but he thinks, "the public should be educated to buy something better."

Of the Bloodgood, he says:—

"I find that the Bloodgood makes a very good summer market pear. It bears liberally with us and seems to be a very healthy tree, not entirely free from blight, yet much more so than either of those other kinds I have named, and I think if I were planting early summer pears I would plant it largely. It sells well, has a golden appearance when it is ripe, frequently with a little russet upon it, and is sweet and rich."

Of Manning's Elizabeth, Mr. Dempsey says:—

"For an early summer pear there is no better than Manning's Elizabeth, which is a delicious fruit and very prolific."

Mr. Dougall gives Elliot's Early, a newly raised pear in his district, the Doyenne d'Été, and the Supreme de Quimper, a leading place among summer varieties.

The Tyson is repeatedly referred to. After alluding to the Rostiezer, Osband's Summer, and Beurre Giffard, Mr. Beadle says:—

“Coming late in the summer or early in Autumn, the Tyson is superior in quality to any I have named.”

Mr. Arnold speaks of it as “a very fine pear, and—with the Seckel—less subject to blight than any in his grounds.” It was one of the sorts that escaped blight in Mr. Graham's orchard. Other witnesses speak highly of it.

Of Clapp's Favourite, Mr. Beadle says:—

“It is an early autumn pear, and will prove as valuable for this country as any I know of. It is about the size of the Bartlett. The tree is hardy and productive. By hardy I mean able to endure the extreme cold of our climate. It is a seedling of the Flemish Beauty, but even more hardy than its parent, and a larger fruit. If allowed to hang on the tree too long it becomes decayed at the core, but you cannot perceive it until you break open the fruit.”

It is hardly so reliable as the Bartlett, according to Mr. Arnold. Mr. Westland recommends it should be picked while yet green, as, if allowed to hang on the tree, it would be liable to decay in the centre. He speaks of it as a favourite pear. Mr. Roy alludes to it as “a new pear with a rich flavour,” and one that “always sells well.” In the County of Perth it is one of the most profitable and most commonly planted varieties.

The Bartlett, however, is the pear, that above all others, commends itself to the orchardist and the public. It is mentioned by Mr. Beadle as one of the varieties that fruit early. He goes on to say of it:—

“Next in point of time in ripening is the Bartlett, which has a great reputation as a market fruit. I suppose more barrels of pears of that variety are sold in our markets than any other. It has brought, until within the last year or two, \$10 a barrel, but of late it has been reduced down to about \$6, partly owing to the stringency of the times, and partly to the increased supply. That variety has been planted largely in the State of New York, and Canada as well, so far as pears have been planted in Canada at all.”

“So far as I know,” he adds, “the Bartlett is the most profitable pear.”

Mr. Dempsey, whose situation tries the hardiness of fruit a little more than is the case in the Niagara district, alludes to the Bartlett as “tender,” and needing a more “favoured locality” than some other pears. But Mr. Arnold says: “The most successful variety of pear, everything considered, is the Bartlett.”

Mr. Allan's testimony is:—

“The most popular pear is the Bartlett; on account of its being so profitable

it is far ahead of any of the others . . . The Bartlett is fruited, probably, earlier than any other variety."

Mr. Roy says of it: "It comes in early and is easily sold." Mr. Leslie, "has seen nothing to beat the Bartlett; the tree bears well and the fruit is good."

These testimonials, from authorities so unimpeachable, must establish the Bartlett's supremacy on its economical merits.

The Ananas d'Eté is only alluded to in a passing remark by Mr. Dempsey, but Mr. Leslie, in his catalogue, describes it as a large, handsome pear, resembling the Bartlett, which ripens about the same time as the latter, and, being hardier, may be regarded as an exceedingly promising variety. The Souvenir du Congrès, with which the list of Summer Pears ends, is mentioned by Mr. McKenzie Ross as a pear no garden should be without.

Autumn Varieties.

Coming next to the Autumn Pears, we have first upon the list, the Belle Lucrative, which Mr. Beadle describes among amateur varieties as "a sweet, rich pear," but one that, without a good deal of sunlight and exposure, is apt to be discredited by a good many imperfect specimens. Several others recommend it, but do not particularise its merits.

Of the Beurre Hardy more will probably be heard in the future than in the past, for it is now being thoroughly tested under the auspices of the Fruit Growers' Association. It is described as a tree of more than usually hardy and vigorous constitution, and "is ranked in pomological parlance as 'very good.'"

The Beurre Superfin ranks as "good," but as inferior to the Beurre Hardy.

Mr. Beadle gives the Buffum the one notice it receives in the evidence by remarking:—

"I don't think the Buffum would succeed in Canada as a profitable market sort. It will succeed on sandy soil better than most other varieties, but there is not much money in it as a market pear."

The Onondaga curiously comes in for notice from witnesses at two extreme points, and no others; Mr. Dougall at Windsor, who speaks of it with others, classed as "the best varieties," and by Mr. Usborne, at Arnprior, who refers to it as one of two varieties only that are, so far, apparently, doing well in his—for pear culture—comparatively unfavourable district, where any pear tree must, in order to succeed, possess to a very large degree the element of hardness.

The Goodale is mentioned by Mr. Arnold as a new pear, and "likely to become popular."

The Howell receives only a word in passing from Mr. Jno. Graham as free from blight during the period in which some other trees were affected. It is, however, a pear of fine flavour, while the tree is hardy and yields a good crop.

The Flemish Beauty is a delicious pear, but, says Mr. Beadle:—

"Is a very desirable pear for home use, but not profitable, especially as nine people out of every ten do not handle it properly; it is generally shipped to market too ripe, and the result is that the consignee sends back only a long bill of charges."

With Mr. Dempsey—although generally in his neighbourhood the Flemish Beauty has done well—the fruit has, for some years, cracked so as to be hardly distinguishable. Mr. Westland mentions it as peculiarly liable to the ravages of birds. On the other hand, Mr. Cady regards it as one of the pears least susceptible to blight. At Windsor, in Essex, its fault is that "it ripens too early," although Mr. Dougall speaks of it as "a hardy pear." Its hardiness is further attested by its successful cultivation at Arnprior, in Renfrew. It appears to succeed well in almost any pear-growing section. The report from the United Counties states that it is the only pear tried in that neighbourhood (Cornwall).

The Sheldon, of amateur varieties, is a pear of high quality but a great sufferer from blight.

The Beurre Bosc is a pear much appreciated where it can be grown, but is too tender for the average Canadian climate.

The White Doyenne is a good marketable fruit when successfully grown, but, according to Mr. Beadle, too subject to disease to be reliable on economical grounds.

The Grey Doyenne is less liable to disease, but the tree is a feeble grower.

The Doyenne du Comice is mentioned by Mr. Dougall among the best varieties, but not alluded to by other witnesses.

The Louise Bonne de Jersey is frequently and approvingly mentioned, and is cultivated in some districts that demand a hardy tree to ensure success.

The Graslin is spoken of by Mr. Dougall as one of the three most profitable varieties within his knowledge.

The Seckel is conceded by all to be a very fine pear and, in Mr. Arnold's experience, is, with the Tyson, less subject to blight than any varieties in his grounds. Mr. Cady considers it "the richest pear we have," and agrees with Mr. Arnold as to its comparative immunity from blight, in which view he is also sustained by the evidence of Mr. Dougall.

The Duchess d'Angouleme is an extremely popular pear. After speaking of the high prices frequently realized by the Beurre d'Anjou in New York, Mr. Beadle goes on to say :—

"There is another variety that will last a little longer than that, and is very popular as a market fruit in Western New York. It could possibly be grown as profitably in this section. I refer to the Duchess d'Angouleme; it is a remarkably healthy tree and as nearly free from blight as any variety we have. I have seen quite a number of pear orchards ruined by the pear blight, but I have never seen one of that variety seriously affected. It is no uncommon thing for those pears to sell for 12½ cents a piece on the Philadelphia and New York markets. They are large sized, handsome pears, of fair flavour though not the highest quality of fruit."

Both Mr. Beadle and Mr. Morris put it as only second to the Bartlett among the most profitable sorts to cultivate. It does not, however, appear to be successful in Prince Edward County.

Winter Varieties.

First on the list of winter varieties stands the Beurre d'Anjou, of which Mr. Beadle says :—

"Following the Bartlett, I suppose the next best variety would be the Beurre d'Anjou; that variety will last into November, and sells at a very good price; in fact it has sold at fabulous prices. I have been told that barrels of it have been sold for \$30 in the Boston market, and I presume it would readily bring \$15 now."

Of the most profitable varieties Mr. Beadle places the Beurre d'Anjou third on the list. Mr. Dempsey says of it :—

"We grow a considerable number of the Beurre d'Anjou; with us it keeps till Christmas; we esteem it highly, but it is not very productive in our section."

Mr. Dougall regards it as one of the most profitable pears to the grower.

Of the Beurre Clairgeau Mr. Beadle says :—

"The Beurre Clairgeau is a good pear when fairly cultivated. In the hands of persons who are skilled in handling pears it would prove very profitable. It is a large sized pear, of most beautiful appearance and colour, but it requires to be handled very differently from the way we handle fruit generally."

He goes on to say, by way of illustrating his remarks :—

“The fruit should be gathered just as it is about ripe, and not allowed to hang too long on the tree. One rule is that when the stem separates readily from the tree the fruit should be picked and packed in boxes, and then covered with an old carpet or woollen sheet or something of that kind to exclude the air. They should be kept in a cool place until they are wanted for use; if they are then brought into a warmer room they will ripen into a most excellent quality of fruit.”

The Beurre Clairgeau, Mr. Dougall styles “a large and handsome pear that will keep till Christmas.”

Of winter pears, up to the middle of January, the Lawrence would stand first in Mr. Beadle’s estimation. He places it fourth on the list of the most profitable varieties.

“Mr. Morris ranks it as the best pear for winter use, in company with the President Drouard, which is there and there only alluded to in the evidence.”

Mr. Leslie thinks “it might be likely to take in the English market.” In the last mentioned suggestion he connects with the Lawrence the Vicar of Winkfield, and expresses the opinion that these are the only two varieties we could safely ship to Great Britain, as the others do not carry well.

But of the Vicar, Mr. Beadle says :—

“The Vicar is one of the most variable pears I have had any experience with. Once in a long time you will get a crop that is really good, but probably for a number of years after you will have nothing eatable. However, my experience has been largely in sandy soil, and I think that in a warm clay soil, with great care in thinning out, better results might be obtained. The fruit should be allowed to develop to its natural dimensions.”

The Josephine de Malines, which pens about the middle of January, is a fine pear, but late in bearing, not yielding any profitable return until it is about twelve years old. But it is very highly esteemed by some growers. Mr. Dempsey says of it :—

“For winter pears I would place above all others the Josephine de Malines, because it produces so much fruit. The fruit is rather inferior for the first few years, but when it has been about ten years planted it is very fine. It has beautiful rose-coloured flesh.”

Mr. Dempsey also suggests that this pear might be profitably shipped to Europe.

The Oswego Beurre is the fruit of a hardy and prolific tree, and recommended by some of the witnesses, including Mr. Leslie.

"The Beurre d'Aremberg," says Mr. Beadle, "in a well drained, warm clay soil, would be a good pear to plant, and the amateur would enjoy it very much."

"The Beurre Easter," says the same good authority, "is the best of the very late pears I have tried."

"The Beurre Diel on clay soil is of good quality, but on sandy soil is almost worthless, because it has no flavour," is Mr. Beadle's verdict as to this pear.

Mr. Roy and Mr. Chaplin both speak highly of the Winter Nelis.

With this pear the list is exhausted, and some hints necessary to the successful cultivation of those varieties, which the information already given may induce the agriculturist to grow, will be next in order.

The Soil and Cultivation Favourable to the Pear.

The soil best suited to the cultivation of the pear is quite different from that required by the apple. Apples, as already pointed out, will grow in almost any soil, so long as they have a porous subsoil; and, although, pears may grow to a greater or less extent under unfavourable circumstances, yet, for their profitable cultivation, a suitable soil is essential, and a rich clay loam is the soil in which they will thrive most vigorously, while a stiff blue clay subsoil, so long as it is not cold or wet, will often show a vigorous and prolific pear orchard. Mr. Roy at Owen Sound finds pears do extremely well in a clay loam resting on a limestone rock.

Nor is it advised that, as with apples, the pear orchard should be cultivated. Except to keep down the weeds, cultivation of any kind is undesirable. Manuring is generally confined to the application of leached ashes. One witness, Mr. Dougall, formerly manured, but substituted wood ashes, as he believed the rotted barnyard manure stimulated the tree to too rapid a growth so that it did not ripen its wood in the fall.

Planting Out.

Pears as standards should be planted not less than twenty feet apart each way, and some of the spreading varieties may require a little more room than that would give them. Dwarfs—that is, pears grafted on the quince stock—may be planted from 10 to 12 feet apart; the latter distance will give them abundance of room.

Pear Stocks.

The question whether the pear should be grafted on its own or on the quince stock is one that does not admit of a simple answer. A standard pear tree will

be from a graft on the pear stock, while the dwarf will be on the quince. The standards, rooting deeper and gathering nourishment from a larger area, are the more hardy and enduring. The dwarfs, on the other hand, are popular from the fact that they mature earlier—often by two or three years—and are exceedingly productive. Their greater susceptibility to frost is provided against either by mulching with manure or piling a little earth over the roots, which in the spring is again removed. The whole matter of choosing between the pear stock and quince is one for intelligent observation and discretion. Meantime, the following opinions of some of the experienced witnesses, called before the Commission, will be a guide to the novice in pear culture. Mr. Beadle says :-

“In some varieties I would give the preference to those grown on the quince, over those which are grown as standards. If I were planting an orchard of the Duchesse d'Angouleme, I would plant them on the quince root. It grows well, and comes into full bearing three to five years sooner than the standard. If it overloads it can be thinned out so that the fruit will be perfect. If I were planting the Bartlett I would sooner have it on the pear stock, so that one cannot give a categorical answer as to which is the better plan. Taking pear culture as a whole, I would sooner plant on the pear stock, especially taking into account the present knowledge of the art.”

As to these two leading varieties which the agriculturist intent on laying out an orchard is pretty sure to select as his staple trees, the one for winter, the other for summer fruit, Mr. Beadle's judgment will probably influence his selection. Mr. Dempsey, whose operations are conducted in a district where the winters are felt in some severity, gives an unqualified opinion in favour of the pear stock standards. Mr. Arnold has never been able to grow pear stock at work, but has imported the wild Scotch pear stock, which he says has succeeded admirably. He remarks :—

“We should work our pears on some wild hardy stock. I would much prefer working it on quince stock, budding low and planting the pear down below the surface so that the tree begins to bear immediately, and yet throws out roots from the pear stock which become standard trees. I would rather take such a tree than a pear worked on poor pear stock. By poor stock I mean lacking any hardihood. They have not the hardy character of the wild Scotch or French pear. They are not reliable ; first, because, of seedlings, no two are alike in robustness of character. You may get one good and ten bad, while if they are grown on quince stock they are all alike. I am satisfied that the stock exercises a great influence over the tree that is grafted on it, and also upon the fruit.”

He goes on to state that the Duchesse d'Angouleme would be an all but worthless pear unless worked on the quince, while the Seckel will not grow on quince and must be grafted on a hardy, vigorous pear stock. In the Huron district, preference is given to standards. But at Owen Sound, taste or experience seem to point in another direction.

“The standard trees,” says Mr. Roy, “will sometime produce at eight or nine years, but sometimes not till the end of fifteen years, whereas if you go into dwarf trees you may depend on them in four or five years.”

Of the varieties referred to in the evidence the following succeed well on the quince:—

SUMMER.—Bloodgood, Doyenne, d'Été, Tyson, Souvenir du Congress.

AUTUMN.—Beurre Hardy, Howel, White Doyenne, Grey Doyenne, Louise Bonne de Jersey, Duchess d'Angouleme.

WINTER.—Beurre d'Anjou, Beurre Diel, Gswego Beurre, Vicar of Winkfield.

The judicious pruning of the trees, particularly the dwarfs, which must be annually trimmed with a view to preserving their symmetrical appearance, is indispensable. The removal, too, by thinning, of a portion of the fruit will greatly enhance the quality of the remainder and the ultimate return from the year's crop.

The Market for Pears.

Unlike the apple, the market for which will be mainly looked for abroad, the consumption of the chief portion of the pear crop must, of necessity, be at home. From Owen Sound, Lake Huron, and the western counties, some outlet may be found in the great American cities; time, too, will create a demand in the North-west, where pear culture will be all but an impossibility. Two or three varieties, the Vicar of Winkfield, the Josephine de Malines and the Lawrence have been suggested as possibly suitable for the English market. But in constitution, and even in shape, the pear is far less well adapted for travelling than the apple is, while the taste of the consumer is more exacting and the demand more limited. At present, except in a few cases, as already mentioned, pears must be grown in view of the Canadian market chiefly, not a few being shipped from the West to Montreal. In most districts large accessions are being made so the area under pear cultivation, not over fifty per cent. of the trees, in many districts, being as yet in full bearing. The price of pears appears to run from \$1 to \$3 per bushel, although favourite varieties, under the influence of a special demand, often bring more.

Picking and Keeping Pears.

A great deal depends on the manner in which pears are picked, handled, and kept afterwards. In referring to the Beurre Clairgeau, Mr. Beadle's advice as to the time for picking and the mode of keeping has been quoted. All pears should be picked when, on lifting the fruit with the hand, the stem naturally separates from the tree. Mr. Beadle's plan is to pack them in boxes in a cool place covered with an old carpet or woollen cloth to exclude the air until they are wanted. If then placed in a warm room they will in a short time—a few days at most—gain their full flavour and ripeness. If ripening pears be a matter of business, it will pay, Mr. Arnold thinks, to have a room specially devoted to the purpose. For shipping and keeping in store a little different treatment may at

times be necessary. Mr. Beadle, with this in view, supplements his remarks with the following:—

“I think most of our varieties don't require the blanketing process. The fruit should just be put into tight boxes or barrels; I prefer half barrels for pears. In the full-size barrel the weight of the fruit presses upon the lower tiers too much. When shipping for market they must be shipped hard enough to reach their destination before becoming soft. I suppose most cultivators have now got past that difficulty in shipping the Bartlett. The Bartlett should be picked before it separates readily from the tree. It may be gathered when about two thirds grown, and even then it will ripen up in the barrel with a fair flavour, and become altogether a nice fruit, though I prefer it at full size.”

But, as a rule, all pears should be picked “a little on the green side.”

CULTIVATION OF THE PEACH.

The region adapted to successful and profitable peach culture in Ontario is much more limited in area than that of the pear. By far the largest and most numerous peach orchards are to be found in the Niagara peninsula, where peach growing has become an enormous industry. Reliable statistics of peach culture are wanting, as are those of other fruits, but some idea of the magnitude of the business may be formed from the fact that from the Grimsby Railway Station alone, some 70,000 baskets were shipped last season, of peaches grown within an area of a couple of miles east, south and west of the station, which is near the lake. Along the shores of Lake Erie, in Norfolk and Elgin, peaches can be profitably cultivated, and a good number are grown. There are some considerable orchards in the southern half of the County of Oxford; and in Kent and Essex, on Lake Erie and Detroit River, if they are not grown so extensively as they might be, it is owing to want of energy on the part of the cultivators, not to any unsuitability of soil or climate. Fine crops were seen by the Commissioners ripening on the lake shore in Kent during their visit, and in Essex we have the testimony of Mr. Dougall that “peach growing is far more profitable than apple growing, although the crop is not quite so certain,” and that it is even more profitable than general farming. But as we come back from the lake, peach culture, on any appreciable scale, gradually vanishes. It cannot be carried on profitably in either Lambton or Middlesex, or in the inland south-western counties, unless we except one spot in Waterloo, where Mr. David Caldwell, a most enterprising and enthusiastic orchardist, claims that during the last few years he has grown not only sufficient for his local demand but also for shipment elsewhere. At Owen Sound a few are grown although not very successfully, but at Goderich Mr. Allan says:—

“Peaches are grown with us to some extent, and they can be very profitably cultivated, as the trees stand the winter well. For forty years back we have had no instances of winter killing for at least six miles inland along the lake section.”

East of Hamilton the peach has no standing, except in an amateur sense

Mr. Beadle thus sums up the limitations of peach culture in Ontario :

"I regard certain parts of Canada as particularly favourable to the growth of peaches, both in soil and in climate. The limits of peach culture may be said to be the peninsula between the lakes, the northern shore of Lake Erie, and a small district on the south shore of the Georgian Bay. Various attempts have been made to cultivate it elsewhere, and for a time the tree will live and thrive, but the severity of the winter usually kills the fruit buds. The natural home of the peach is Northern Persia, where the climate is very like our own, sharp cold winters—though the thermometer does not go down to 30° below zero—and quick warm summers. Within the limited area I have mentioned, we can compete in peach growing with the United States. We get peaches imported from New York, New Jersey and Delaware earlier than our own, but as soon as ours come in they take the market, owing to the less cost of transportation."

Mr. Dempsey, although not very successful himself, appears to think peach culture might be extended in Prince Edward Island.

For peaches—except at a few favourable points where neighbouring American cities create what is, in effect, a local demand—the market is strictly at home, using that term to describe the four original Provinces of the Dominion. Considerable quantities are finding their way by the Intercolonial Railway as far as Halifax. A canning industry too has been established at Grimsby, where 150 bushels of fruit can be put up in a day.

Soil and Aspect.

"The peach thrives best on a warm light soil. It will not thrive on a heavy clay or damp soil." "The trees should be planted in sand or gravelly soil." These quotations from the evidence of experienced peach growers sufficiently indicate the character of the soil to be selected. As to the question of aspect Mr. Beadle says :—

"If I were planting a peach orchard I should prefer a northern aspect, because it is there retarded in spring, for if the blossoms are not prevented from coming out too early in the spring they are apt to be caught by the late frosts. I have noticed that peach orchards growing on the north side of buildings, forests, etc., and sheltered so as to have their growth retarded in the spring, are much more likely to give us a good crop of fruit. One cause of the destruction of the peach crop is that the warm suns of early spring start the sap, then comes a cold night, and the blossom bud is killed before it opens at all. I therefore prefer an aspect by which the trees are sheltered from the rays of the sun in the early spring."

The peaches mentioned by name in the evidence are as follows :—

Early Canada.	Beatrice.
Hales' Early.	Old Mixom.
Waterloo.	Smock.
Alexander.	Early Purple.
Amsden's June.	Early Rivers.
Wilder.	Mountain Rose
Early Crawford.	Honest John,
Louise.	Late Crawford.

Sixteen varieties in all.

The Early Purple was once regarded as one of the earliest varieties, but is now superseded by others.

The Early Canada was a chance seedling of Hales' Early, and has just made its appearance in the market. It is one of the earliest, if not quite the earliest, to ripen.

The Waterloo is another new and very early variety ; so, too, is the Wilder, which is a good deal like Amsden's June.

Old Mixom is named by Mr. Pettit in company with the Smock as a profitable fruit.

The Early Rivers is spoken of by Mr. A. M. Smith as a very promising variety, coming in right after the Early Beatrice.

Mr. Morris mentions the Mountain Rose as one of the most profitable varieties this year.

Honest John has a passing mention only from Mr. Toll.

Of the more largely grown peaches Hales' Early is now beaten, both in point of time and quality, by some of its own offspring. It is, however, needed, with others, to maintain a continuous supply through the season. Mr. D. Caldwell says of it :—

"Hales' Early is about the most profitable of any for market, though the fact that it rots so badly detracts from its profitableness."

In Norfolk it is regarded as one of the two most profitable varieties, and is the peach that ripens earliest in Oxford.

The Alexander is another very early peach. In Goderich, Mr. Allan says :—

"One of our best growers says he would plant the Alexander, Hales' Early, and Early Crawford for profit before any three that could be named."

In that district the Alexander, with most growers, is the earliest to ripen. Mr. Westland says :—

"I think the Alexander is the most profitable of the early varieties," and it is the first of all to ripen at Grimsby.

Amsden's June is not so early as some others, but appears to have rather imposed, by its name, on the confidence of fruit growers who find it ripen later than

its designation implies. In Elgin, however, it seems still to retain its reputation as the first to ripen there.

In Essex, the Louise is a favourite, although not so early as the Alexander. As a choice variety it has brought \$3.20 per bushel, for shipment, at Goderich. Mr. D. Caldwell, who grows the Beatrice in Waterloo, had pulled some of the fruit ten days previous to giving his evidence on the 18th of August. The Beatrice is mentioned in several places with favour.

But the peach that undoubtedly outbids all others in popular favour is the Crawford. Mr. Beadle "thinks the Early Crawford is the most profitable peach yet known."

"Crawford's Early," says Mr. Allan, "is looked upon as being, on the whole, the most profitable."

"The most profitable peaches," says Mr. Dougall, "are the Alexander and Crawford's Early."

Mr. Pettit says:—

"The early and late varieties this season have been the most profitable, and on an average, I think are always the most profitable. I don't know that Early and Late Crawfords are more prolific than others; I consider them better for canning. Three years out of four we will have extreme heat during their time of ripening; they will be rushed on the market and sold at low prices, while the very early and late varieties, although not so good in quality, will bring better prices. In point of quality I consider the Crawfords quite superior to the others."

"Most of the early varieties were profitable," says Mr. Morris, "before the Crawfords. The Crawfords brought prices down."

Mr. D. Caldwell thinks the Early Crawford brings higher prices, but does not yield so largely as Hales' Early.

"The Early Crawford trees, I think," says Mr. Roy, "stand the winter best."

The evidence, taken collectively, fully bears out the statement of one witness, that on the whole the Crawfords stand first among peaches.

Planting and Cultivation.

Peaches are grown both upon the peach and plum stock, but of the latter practice Mr. A. M. Smith says:—

"I have seen peaches growing on a plum stock. Several years ago it was argued that peaches would be hardier on a plum stock; we tried the experiment, but didn't find anything in it."

It has already been mentioned, in connection with apple culture, that peach trees are sometimes planted between the rows in apple orchards to secure a return

while the apples are coming into bearing. Mr. Toll says on the subject of peach orchards :

"I have planted my trees too thickly, and if I were planting again I would put them fully eighteen feet apart. For trees in full bearing two and a half to three bushels per tree, is about the yield in good years, but in some years the yield is much less. Peach trees are short-lived. They will keep up a good yield seven or eight years, but they will require six or seven years to attain the age at which they will yield as much as I have stated. Peach trees cost me 15 cents a piece. I purchase mine at Munroe, Mich. We adopted no particular means of getting rid of the curculio on the peaches, though we did on the plums."

Mr. Pettit says:—

"A peach orchard requires renewing every fifteen years. Our plan is to be continually taking out old trees and replacing them with new ones."

"Eighteen feet apart each way is the proper distance for planting peach trees, in an orchard where there are peaches only. I have done very little pruning, and cut out only the dead wood. I allow the trees to branch out very near the ground; and consider thinning the fruit preferable to so much trimming. The fruit is equally good without trimming. I would cultivate the soil about the trees. A paying crop should be expected after five years' planting; you would have some peaches before that time, but not a paying crop."

Mr. Pettit's large practical experience in this particular department constitutes him a first class authority in relation to peach orchard management.

The Yellows.

More fatal than the Fire Blight to the pear, and the most serious enemy the peach has to contend with is the disease known as the Yellows. Recently in some parts of Niagara district its effects have been more than usually disastrous. In the vicinity of Drummondville the peach orchards have been nearly all destroyed, the diseased trees being rooted up as the only means of getting rid of the plague. Mr. Pettit gives the following account of the Yellows:—

"Some of our trees have suffered to a considerable extent from the yellows, This disease first appears in the fruit, which becomes a bright red colour on the outside and reddens through to the pit, and ripens two weeks earlier than its usual period. A portion of the tree only will ripen, while the other will not. The fruit itself is insipid, flat, and not pleasant, although of a bright or spotted appearance on the outside. There is no appearance of disease in the foliage until the latter part of the season or the year following. I don't think you will find any tree recover after it has once been attacked with the disease. The first appearance of the disease is seen in the fruit. I attribute the spreading of it to insects and bees. We have dug around the roots of some trees and they were apparently very healthy. I have not known any injury to result from people eating the diseased fruit. In the localities where the fruit is grown it is not generally eaten. The only remedy I can recommend, and which I have carried out to a certain extent, is to chop the diseased trees down and burn them up at once, fruit and all. I regard the disease as infectious. It has become very much more prevalent of late years. Three years ago was the first we saw of it. I

think it was brought to our locality by trees purchased from the other side. We have been cultivating peaches largely about twenty years, but we have grown peaches more or less ever since I can remember. There are no means of detecting whether the tree is infected with the disease when sent from the nursery. It does not manifest itself the first year either in the wood or roots. The next year after the disease has made its appearance, or the second year, there appears a discolouration. I have only had two trees affected on my place, and these I removed at once."

Unfortunately one effect of the disease on the peach is to make it more early saleable, and as the possession of the earliest supply of this much coveted summer fruit means high prices and large profits, there is a direct inducement to fruit growers, if not very scrupulous, or to merchants, if ignorant of the symptoms or greedy of gain, to put infected peaches into consumption. It is noticeable that in the peach districts people do not, Mr. Pettit says, usually eat the diseased fruit. But there is evidence that they are shipped to Toronto and other great consuming centres in large quantities.

Mr. A. M. Smith says:—

"I saw some of the diseased peaches in a store in Toronto lately. The dealer said that they were a new variety of peaches, not knowing they were unsound fruit. There is no trouble in telling the diseased fruit. It is always blotched or spotted with red, and red inside, particularly about the pit, and clings more or less to the pit. If slightly diseased, the flavour may not be wholly destroyed, but if very bad, they will be insipid and worthless. Many towns and cities in the States have prohibited their sale in their markets under heavy penalties, and I think, if our own towns and cities would do the same, they would confer a benefit on the inhabitants."

Mr. Pettit adds the following comfortable information:—

"When I was on the wharf here (Toronto) one day this summer, I noticed that about two-thirds of the fruit exposed for sale was diseased. I should think these peaches were unwholesome. I should not care to eat them myself."

It is quite possible the dealers on the wharf, or the Toronto storekeeper, were unaware of the character of the fruit they were distributing, but the disease is clearly one easily enough detected by any fruiterer or orchardist once made acquainted with its characteristics. The fatuous stupidity, or worse, of some growers, too, is almost past comprehension.

Mr. A. M. Smith says:—

"The disease spreads very rapidly. I planted an orchard with a man four years ago last spring in Stamford. Three years ago, this last fall, there was one tree which I saw was affected with the yellows. I told him to have it cut down, but he said it was a pity, and allowed it to stand. The next season there were twelve trees affected by the disease, and the year following there were about 200 diseased. To-day there is not a sound tree out of the 250 originally planted."

It is rather satisfactory to hear that the obstinate man has been pursued by the Nemesis he invited in spite of warning, but unfortunately his punishment was, in all probability, shared by scores of unoffending fruit growers. It is sug-

gested that birds and bees carry the infection from tree to tree. Boys are also stated to be busy assistants in the work of mischief. Mr. Morris says:—

“It is generally acknowledged that the disease can be propagated from the pits. It is customary for boys to gather peach pits and dispose of them to men, who again sell them to nurserymen to plant. There is a danger here, and nurserymen should be cautious where they get their pits from.”

Between birds, bees, boys, stupidity, and avarice, the peach orchards of Ontario stand a poor chance, if no one comes to the rescue. Mr. Morris and others urge legislation. He says:—

“We have tried to do something for the extermination of the yellows, and I would like to urge the importance of having some compulsory measures taken to prevent its extension. The only thing you can do is to prohibit the importation of trees from localities where the disease is known to exist. That, of course, would be a difficult matter to do. The Legislature of Michigan has passed a bill compelling parties to cut diseased trees down. We tried to incorporate something of that kind in the bill for the suppression of the black knot, but it was thrown out. I think it would be desirable to have some kind of legislative action towards the extermination of trees diseased with the yellows. I would have Commissioners appointed to look after the disease, and let complaints be laid to them, and they then warn the parties. . . . I think if it was generally known that there was a law against diseased trees, and that it would be enforced, people would be apt to be cautious. It is easily told if a tree is diseased at the time of bearing, from the colour of its fruit.”

It is vain to hope that legislative restrictions will prove sufficient in all cases against the impulses of selfishness and greed. Among the great peach growers of any particular district there will probably not be found one man so selfish or so base as to run the risk of disasters to himself, and injury to the health of the public by raising in his orchard affected trees, or sending diseased fruit to market. But the cultivation of the peach is not limited to a few persons, or a single district, and the evidence already quoted shows that the danger from this source is ever present. Legislation is useless, if the law enacted does not receive the hearty support of the community, and especially of those for whose especial benefit it has been placed on the Statute book. We have in Ontario an excellent Act for the suppression of the Canada Thistle, but whatever crop fails to repay the labours of the husbandman, the thistle crop is always a safe one in nineteen townships out of twenty. By-laws have been enacted in nearly every township to restrain wandering beasts, but if people do not turn out their stock to graze on the roadsides it is not because of those numerous and well drawn by-laws. However the experiment might well be tried, and, as in the case of the black knot, the yellows might be legally proscribed.

Something like a panic exists at the present time among the peach growers in the sections where the fruit is most largely cultivated, and a man whose interests are so seriously at stake would be unlikely to overlook or pardon the transgressions of the ignorant or the knavish.

Action, too, by municipal and other authority, in the cases of diseased fruit being exposed for sale in Toronto and elsewhere, as described by Mr. A. M. Smith, would have a very healthy effect upon merchants who are either unable to discover the fraud or too anxious to make a profit out of the pseudo-early peach, to refuse to be parties to it.

THE APRICOT AND NECTARINE.

Of these fruits Mr. Beadle says:—

“Apricots and Nectarines are cultivated in our district to a very limited extent. Both these fruits are subject to the curculio, and that is the reason they have been neglected. The trees fruit regularly. I think the apricot is in a measure hardier than the peach; the blossom buds will stand a lower degree of temperature without being killed. The number of varieties grown is very limited. The Early Golden and the Breda are about the only ones. Some seedlings have been raised, but no names have been given to them. The fruit of these seedlings is beginning to be brought into market quite freely, and I am inclined to believe that, if the same care were taken with apricots as has been devoted to other fruits, we might raise a race that would do well. The foliage of the apricot is peculiarly free from insect depredations.”

This statement nearly represents the state of apricot and nectarine cultivation in Ontario. There appears to be no reason why fruits so delicious should not be cultivated wherever the peach succeeds, and a market demand is sure to follow a plentiful production with the result of moderate prices. Some attempts at their cultivation are being made in the Goderich district, and Mr. Allan adds to the rather meagre list of Mr. Beadle, the Moorpark, Elongé, Barton, and Stanwick varieties.

THE CULTIVATION OF THE PLUM.

We are now dealing with an indigenous fruit, and one of which several varieties are to be found growing in every part of the Province. Besides numerous nameless seedlings, there are no less than thirty-two varieties referred to in the evidence, as follows:—

Lombard.
Pond's Seedling.
Coe's Golden Drop.
Fellenberg.
Green Gage.
Peach Plum.
Jefferson.
Yellow Gage.
McLaughlin.
Bradshaw.
Smith's Orleans.
Imperial Gage.
Washington.
Common Blue.
Juillins Golden Gage.
Prince Engelbert.

Magnum Bonum.
Reine Claude de Bavay.
Royal Hative.
Wild-goose Plum.
Damson.
Glass's Seedling.
Columbia.
Greenfield.
Quebec Plum.
Victoria.
Yellow Egg.
General Hand.
Diamond.
Prince of Wales.
Guthrie's Apricot.
Brandy Gage.

The cultivation of the plum being universal, the question of selection will depend chiefly on situation. It may, therefore, in this instance, instead of noticing in detail the merits of the several varieties, be well to turn to the evidence of the respective witnesses, and see what, from their experience of soil and climate, has been the choice they have made. It is impossible to refer, however, to plum culture without at once encountering the curculio, its bitterest enemy, although as already stated, the subject of insects affecting fruit will be dealt with separately.

The Plum Orchards and Varieties Cultivated.

Above all other portions of the Province, the Owen Sound district excels in the cultivation of the plum. The soil is a clay loam, resting on limestone rock. The rot is the chief trouble that assails the plum cultivator in this region, and that not to an alarming extent. Black-knot is not a serious evil there. The curculio has not yet made its appearance. The varieties of plums mentioned by Mr. Roy, the representative of the fruit growers of the district, as grown there, are: the Lombard and Pond's seedling, described as "very good plums for shipping;" Coe's Golden Drop, "always saleable;" the Fellenberg, "a prune plum which is very good," "can be eaten either fresh or dried," is "a sweet nice plum, and separates from the stone very easily;" the McLaughlin, Washington, Yellow Egg, General Hand, and Reine Claude de Bavay, but "these must be eaten very shortly after they are pulled." The Diamond is recommended as "one of the best for exporting," and the Victoria, Mr. Roy advises, "should be planted very largely, as it is very good for exportation." Of the trade done Mr. Roy speaks as follows:—

"Perhaps for two years past, some of my neighbours have planted some thousands of plum trees, from 500 to 1,000 trees in some cases. It is becoming to be a trade of large dimensions. This summer, in Owen Sound, I have seen them ship as many as 2,000 bushels in a day. 14,000 or 16,000 bushels must have been shipped from the district of Owen Sound this year. . . . The average price of plums for a number of years has been about a dollar a bushel. This year they were about ninety cents a bushel. Nearly all the plums I have mentioned, as having been exported from Owen Sound, went to Chicago. There is no particular method of packing plums for exportation except to pick out the spoiled ones, and even this cannot be done thoroughly as it takes up too much time."

The mention of the prune plum suggests the possibility of increasing the demand by adding to the supply of fresh fruits the prune, or plum in a dried state. Of this fruit Mr. Roy says:—

"There are very few prune plums grown in our district, but those who do grow them usually have them dried. If they dried these prune plums under the same process as the French plums they would look as well. The Fellenberg eats better than any prune I have ever seen. The prunes of commerce are laid over with sugar, which makes them sweet, but in the Fellenberg no sugar is required, and they are very sweet after being dried. This plum has been recommended by the Fruit Growers' Association, and its growth is increasing. I was the only exhibitor of this plum for some years, but now you find it planted here and there. It might be grown to a large extent, and at a profit."

The Fellenberg is a hardy plum, and thrives not only in the mild climate of Owen Sound, but in the sterner region of the Ottawa. It is also mentioned by Mr. Roy as being exempt from rot, which afflicts all other varieties he is acquainted with. In the Goderich district, soil and climate both favour the plum so much, that, when the curculio first made its appearance, it was regarded rather as a welcome visitor, for it lightened the crops that were formerly so heavy as to break down the trees. But when the fruit growers of Huron, who were too indolent to thin out their plum crops, had a little more experience of the curculio, they found the partnership unprofitable. Working on shares with him meant, that the plum growers found all the capital and labour and Curculio destroyed all the fruit. At all events, he has effected so great a change that, where plums grow in the greatest profusion, their cultivation is declared to be unprofitable, and the question now is not, How shall we thin out the plums? but, How shall we thin out the curculio? And they give up the answer in many cases in despair. The rot is also a drawback to the cultivation of the plum.

The black-knot is an occasional visitor, but does not do much mischief. Mr. Allan says of it:—

“We have the black knot, but we don't regard it as a formidable enemy, though we insist upon the people cutting it. I think it is an advantage to cut it early, before the knot bursts, and cover the wound with salt. Recent legislation has not helped us much, with regard to the black-knot, because we cannot get persons to take hold of it, though the Horticultural Societies sometimes do. We have never had to prosecute. A warning, generally, is sufficient. We just go to the person in whose orchard it is found, and tell him kindly the harm he is doing to himself and others by allowing it to remain. We find the black-knot on all varieties of plums, though I think the Common Blue is about as liable to it as any.”

The varieties chiefly grown are the Lombard, Coe's Golden Drop, the several Gages, Pond's Seedling and the Fellenberg; but the best plum of all is a local seedling, nameless as yet. Mr. Allan thus alludes to it:—

“We have not given our local seedling a name, and I have not been able to trace it, although I have tried the different growers here and in the United States. It is a purple plum, something like the General Hand in form. It has a strong, medium-sized stem, and is about the same size as that plum. In colour, it is fully as dark as the Prince Englebert. Messrs. Geo. Leslie & Son, of the Toronto Nurseries, are now propagating largely from it. Mr. Bingham, the gentleman who had it first, calls it Bingham's Special Favourite, though he has the recognized Bingham plum. All that he knows about it is, that he found it on a common where a farm had formerly been. The occupant having left, the land was allowed to go wild. He found this tree and transplanted it.”

Of the market and most marketable plums Mr. Allan says:—

“The most profitable plums to grow for market are the Common Blue and Lombard, on account of their good shipping quantities. All the standard varieties find a ready market, however, although considerable loss is experienced in shipping many varieties to a distance. The Common Blue plum we look upon as a

native. It was very largely grown ten or twelve years ago. At that time we must have grown three or four times what we do now. Our plums are shipped to Toronto, Buffalo, Port Huron, Detroit, and occasionally to Toledo and Saginaw. Last year we shipped 2,273 bushels, mostly to the United States. We don't rely upon the Toronto market very much as it is apt to get glutted on short notice. At home, the average price for the Common Blue plum is \$1 to \$1.50 per bushel. The larger varieties sell at from \$1.50 to \$2.25. The Common Blue plum brings from \$1.75 to \$2.25 for shipping purposes, and the others range widely from \$2 to \$4, and some even higher in the States. The Common Blue plum carries best, and the Lombard next. The German Prune carries well, and the demand for it is improving. Good specimens brought \$3.20 per bushel in Saginaw last year. The Fellenberg is also asked for in Saginaw. Most of the varieties are packed when they are somewhat hard. We pack them in boxes made of lath, with a division in the middle of each box. They average twenty-three pounds to the box."

In the Niagara district, the growers seem also to have, to a large extent succumbed to the curculio. Mr. Beadle says:—

"Plum culture has not been profitably pursued in our district, but I know of no reason why it should not be. The reason why it has not been profitable is that plum growers have been contented to let the insects destroy the fruit without taking any pains to combat the evil. But a person planting an orchard of plum trees, and taking care to destroy the curculios, could grow an abundant crop, and get very remunerative prices. Many people have been deterred from growing plums extensively on account of the curculio. They are a scarce article in our market most years. Clay soils are best adapted to their growth, but some varieties will thrive in sand. I don't know that we have been growing plums enough in our section to enable me to tell you what varieties are esteemed."

Of those varieties he is acquainted with, Mr. Beadle puts the Jefferson as "head and shoulders above all others."

The Green Gage he would rank with the Jefferson, but the tree is so slow of growth, and then "only a scraggy little thing," so that it has nearly gone out of cultivation. For the Peach Plum, the Yellow Gage, and the McLaughlin, Mr. Beadle has a commendatory word. The Bradshaw is large and strong, but not equal in quality to others. Smith's Orleans is "very productive." The Lombard is the most productive of all varieties, and the Common Blue plum comes as near to it for profit as any. The price realized for plums in the Niagara section is from \$2 to \$3 per bushel. As in many other places, a local plum, probably a seedling of the Damson class, is ahead of most for its hardiness and productiveness. Mr. Beadle says of this plum:—

"We have in our section of country a variety of plum, probably a seedling of the Damson class of plums, which I think will be valuable, partly on account of its immense cropping qualities, and partly because the fruit seems to be exempt from the rot. Even the curculio does not thin it more than enough to benefit the crop. I don't think that it has any name at present. It originated in the neighbourhood of Jordan, and I have suggested to Mr. Moyer, of that place, that he should cultivate it more. There is reason to believe that it is a seedling, because sprouts from the parent tree invariably yield the same fruit. I am not aware that anybody has propagated it by graft or bud."

In Prince Edward County, Mr. Dempsey has a local favourite of the same prolific qualities, and which he also calls a Damson. He says:—

“The Damson tree is thorny, is rather a slow grower and yet attains a great size. It frequently produces from four to five bushels to a tree. It is very easily cultivated. The euculio takes its share of the fruit, still the tree crops abundantly. It may almost be said to grow wild with us, and often grows in the fence corners. They are regularly harvested and marketed, and sell well in Montreal. When the tree is not overloaded it is a good dessert plum. The skin is perhaps a little thick, but not enough to make it objectionable. I don't know of these being cultivated in any other section of the country; I have noticed what were called Damsons, but they grow differently from ours. I am not able to say where it came from; it is peculiar to the county of Prince Edward.”

A heavy brick clay is the soil Mr. Dempsey prefers for the plum, “so stiff the euculio cannot get into it.”

Plum cultivation is profitable in Prince Edward County. The first of market plums there is the Lombard, and this, and the Imperial Gage, Mr. Dempsey prefers for home use. The Jefferson grows very slowly compared with others. Pond's Seedling, the Washington, the Peach Plum, Smith's Orleans, and some others, are subject to rot in unfavourable seasons.

Mr. Dougall thus refers to plum culture in his county (Essex):—

“I have a large number of plum trees, and have a good crop every year. I would cultivate the white Magnum Bonum or Yellow Egg. The Bradshaw is a tender tree, and the Washington is also rather tender. Oullin's Golden Gage is a fine plum, but rather tender. The Jefferson is one of the best. The Prince Engelbert and Guthrie's Apricot are both excellent plums. People will not buy the English Green Gage just now, as it is too small; they want the large plums. The Brandy Gage is one of the hardiest plums, and bears enormously. The Lombard is, without exception, the hardiest plum we have.

“The most suitable soil for plum culture is a heavy clay loam. The trees are not so healthy when planted in sand, as they are liable to attacks of black-knot and the euculio. The best plan of avoiding insect pests is to keep the trees healthy, as you will always find that the sickly trees are attacked the first. We can sell all the plums we can raise in our part of the country, at from \$2 to \$4 per bushel: \$2 for the small ones and \$4 for the large ones. The Lombard plum sells at from \$2.50 to \$3. Plum-growing is profitable if people only attend to it. I think the whole of this western peninsula would be favourable to plum-growing, except the loose sandy soils.”

Here, too, are seedlings of no mean pretensions. Mr. Dougall says of them:—

“I have raised some very fine seedling plums, and I have one which I think is the handsomest plum we have. It is a large plum, nearly as large as the Magnum Bonum, yellow, with a pale earmine cheek that just comes on when it ripens. Like the peach, it bears on the young wood of the previous year. It is not well known, and I have not disposed of any trees. I have several other fine seedlings, one of which is as large as the Washington and richer than the Green Gage. I have been experimenting a great deal on raising new varieties. We have the Wild Goose plum, of which there are two kinds: one purple and the other red. The purple is worthless, but the red is a very nice fruit. The fruit falls from the trees at once, when ripe, if touched with the finger. It is a delicious fruit and

very hardy. The only one I have that is bearing is in my kitchen yard, where the fowls can get at the fruit, so I do not know whether it is liable to the curculio or not. I suppose it would be as liable as other varieties. The earliest plum is the Royal Hative."

Mr. Leslie, of Toronto, giving the results of his experience, says :—

"Plums are grown to a considerable extent in this district, and the increasing demand for trees shows that their culture must be profitable. We have no tree that is proof against the curculio; even the wild plum is not. There are a few varieties very productive, such as the Lombard, so that they will always bear a crop, notwithstanding the ravages of this pest. We have found the best varieties for this section to be the Lombard, Peach, Yellow Egg, Imperial Gage, Bradshaw, Prince of Wales, Reine Claude de Bavay, and Pond's Seedling. That is a fine lot of plums, and all these varieties do well, and are reasonably hardy. The Bradshaw is perhaps the least hardy, though it does well in this district. The plums I would recommend for shipment are the Lombard, Yellow Egg, Reine Claude de Bavay, and Coe's Golden Drop. I have had no experience in shipping plums to Europe. It is doubtful whether it could be done profitably, though perhaps Coe's Golden Drop, the Yellow Egg, and Reine Claude de Bavay could be shipped with profit if they could be taken through quickly."

According to the evidence of Mr. Hinman, of Grafton, plum cultivation is extending in that district. His opinions so far differ from those of others that he says: "Plums do best in a light lively soil, made rich." His principal varieties are the Common Blue for home consumption, and the Damson for shipment, while he also cultivates the McLaughlin and Washington. Plums sell in his district at about \$2 per bushel. In the United Counties the wild plum grows freely and seedlings should be abundant, but plum cultivation appears to have been pretty nearly destroyed by the curculio.

At Ottawa a seedling seems to hold possession of the field. Mr. Bucke says:—

"We have a plum called the Greenfield; it is said to be a seedling of the Magnum Bonum. It is a fine large plum, and the tree is the hardiest that I know of. It was raised in Russell County, and so far has answered exceedingly well, and will I think stand the climate of the North-West. It is being propagated by Mr. Gildersleeve, of Guelph, and has already been sent for trial to Manitoba. We have never tried to cross the wild plum with the cultivated varieties. Any attempts made in the direction suggested by Mr. Arnold as to getting a good hardy variety of plum in this way would have to be made in the western part of Ontario, because we cannot obtain the blossoms so far east as Ottawa. The Greenfield is not cultivated to any extent at present. We have very little curculio in our district. The heat of summer develops the insects very rapidly, and the eggs of insect pests will live through the severest frost of winter. Peaches are not grown in our district, and we have no cherries."

At Arnprior, in Renfrew, Coe's Golden Drop, the Lombard, Yellow Magnum Bonum, Green Gage, and Fellenberg have all done well; have been six years in the nursery, and have been used to propagate from. A little plum known as the Quebec plum, from Chateaurichie, in Quebec, does well. In the Arnprior nurseries 20,000 plum trees have been budded this year.

In the immediate neighbourhood of Lindsay, plum growing, Mr. Beall says, is not a success. The trees have been winter killed, and although the wild plum grows freely it has seemed impossible to cultivate even the hardier varieties of the orchard plums successfully. A Glass' seedling had survived for a couple of years or more, and this year has fruited. The Lombard has been killed, although Mr. Beall thinks the experiment in that case was not a fair one. Plums on the wild stock have succumbed like others. That in a section of the country where the wild plum grows luxuriantly and yields a most productive crop of fruit, there should be no possibility of raising cultivated varieties, is against all experience. But it is equally possible that the right plum has not yet been found, and how to find it was a point submitted to the veteran hybridist, Mr. Arnold, who succeeded Mr. Beall as a witness before the Commissioners. Mr. Arnold says, "with regard to the native plums of which Mr. Beall spoke, my idea is that where we have such a fruit and can get superior varieties from other countries, we can model the fruit just exactly to what we want. By taking our wild plum and crossing it with our best varieties, we will, in course of time, get a plum, which, in colour, shape, and every other respect, will be best adapted to our climate. I am too old a man to begin that work now, but, if I were as young as the chairman, I should make the attempt. Results could be easily obtained in eight years, that is, you would then get the first crop, and, from that time you could proceed and get still nearer the ideal fruit. You would likely have to cross one hundred plums, all different in character; some will partake of the character of the male and some of the female."

Eight or ten years is not a long period to devote to such an experiment, and the intelligent gentleman from Lindsay, whose evidence elicited Mr. Arnold's remarks, will no doubt be only too ready to co-operate with culturists, in the other parts of the Province, in the good work of providing the district of which Lindsay is an important centre, and other places similarly circumstanced, with acclimatized varieties of this valuable domestic fruit.

In the cultivation of the plum the use of salt and leached ashes as manures is strongly recommended by several witnesses.

CULTIVATION OF THE CHERRY.

The cultivation of the cherry has not obtained such dimensions in Ontario as that of the other fruits already mentioned. Cherries may be divided into two families, the acidulous varieties, represented by the Morellos and Dukes, and the sweet cherries, represented by the Hearts and Bigarreaus. "The former class," says Mr. Beadle, "are all more hardy than the sweet cherries, and can be grown throughout the fruit area of Canada generally." The wild cherry is a well known object to every one in this Province. Of the tart varieties, the one that succeeds best is the red Kentish cherry; it is hardy, not fastidious as to soil, bears

a great crop, and is excellent for all cooking purposes. The English Morello is a good cooking cherry. The early Richmond and Montmorency are also recommended. The Hearts and Bigarreus, Mr. Beadle has no faith in for market cherries, they are so liable to rot. Of the Bigarreus Mr. Beadle puts the Napoleon first, taking everything into account, although the Governor Wood is the best in point of delicacy of flavour. Then comes in order Tradescant's Black Heart or Elkhorn, "a large sweet cherry which ripens later," and finally the Black Tartarian, "a fine showy cherry of the Heart class, which everybody likes."

In addition to the varieties named by Mr. Beadle, Mr. Arnold speaks of the Elton, (a cherry of the Heart family) as "one which everybody should cultivate as it succeeds well." But, "it is too soft and good a cherry to ship." The May Duke has not succeeded so well with Mr. Arnold as with some other people. Knight's Early Black, Mr. Arnold commends as a good cherry. Both Mr. Arnold, and Mr. Allan, of Goderich, allude to a cherry raised in the last named place, and known as the Ne Plus Ultra, of somewhat remarkable qualities. Mr. Arnold says of it:—

"There was a seedling sent to me some years ago by Mr. Mosley of Goderich, which he called the Ne Plus Ultra. I thought little of it at the time, but he sent me some grafts afterwards, and the more I saw of it the better I liked it. I believe it is now the most promising one that we have. It does not grow in clusters but grows out of last year's wood in ones and twos. I never knew of any such occurrence in cherry clusters before. They generally grow on spurs."

Mr. Allan adds to the above the description, that the cherry is a large bearer, is of a bright crimson and yellow when ripe, is not subject to rot, belongs, he believes, to the Bigarreau class of cherries, and, if packed at maturity, might be shipped to England or elsewhere, if packed in small boxes.

To the list already furnished by others, Mr. Allan adds the Yellow Spanish (Bigarreau) cherry, and the Early Purple.

Mr. Allan would cultivate a cherry orchard, and prefers a light soil inclined to gravel.

Mr. Arnold, however, does not like "a very warm, sandy, excitable soil for cherries," but prefers "a sandy loam, inclined to clay."

Mr. Beadle steps in to harmonize this apparent difference of opinion:—

"I have not found the cherry tree very particular as to soil. The Dukes and Morellos succeed well in almost any soil—clay or gravel. The Hearts and Bigarreus are not so well pleased with a clay soil—they prefer a lighter soil, but that preference is overcome by working them on the Mahaleb stock. Nearly all the seedlings grown in our district are good. I have not found any difference in the hardiness of trees grown upon the Mahaleb and Mazzard stocks, but there is a great difference in their adaptability to soils. The Mazzards do not thrive so well on clay soils."

Mr. Arnold also refers to the fruit last above mentioned. He says:—

"All varieties, I might almost say, succeed on the Mahaleb stock, and it is

very rarely that we can get any cherry to succeed on the Mazzard stocks. The Mahaleb bears a little bitter fruit called the bird cherry, which grows in France and England. The Mazzard is, I suppose, the original of the class of that name. I do not know whether it belongs to the Bigarreaus or to the Hearts. Mazzards are tender in most places, and are very often unreliable, simply because Mazzard seedlings seldom turn out two alike. Some will stand the winter and some will not. The Mahalebs are called dwarfs, although they grow quite as high and as rapidly on it as on the Mazzard for a number of years."

Mr. Leslie does not seem to have been particularly questioned on this point, but, on referring to his pamphlet, his preference for the Mahaleb stock is, it may be seen, very plainly expressed. He says, with reference to the stock as well as some other points:—

"In all cases we recommend low standards or dwarfs for our climate, and to be successful with them, they should be planted in a well sheltered position. We work them largely on the Mahaleb stock, that stock being adapted to a greater variety of soils than the Mazzard stock, while it also makes the tree more hardy. Dry, sandy, or gravelly loam is the best soil for the cherry. Manure should be applied to them sparingly. Aim to produce upon your trees a growth short, firm, and well ripened."

The cherry has some insect enemies, to which attention will be paid in due course. Its chief foes are, however, the birds, and if it were proper to anticipate the judicial inquiry it is proposed to make later on into the character and habits of the robin, it might be said he is the worst of the thieves. In Lindsay, where, as it has been shown, fruit growing has great difficulties to contend with, Mr. Beall rather plaintively remarks:—

"Cherries can be grown profitably with us if we had no robins, but as the law now stands respecting insectivorous birds, we do not want any cherries."

He goes on to say:—

"I have, perhaps, thirty or thirty-five trees sufficiently large to produce one or two bushels each, but I never had a gallon of cherries yet. Our section of country is swarming with robins."

From Bruce we get the following:—

"Cherries are grown successfully; the Kentish, May Duke, Black Tartarian, and Early Richmond, being the principal varieties. The crop is chiefly consumed at home, and if one correspondent is correct, largely by birds, the robin being the chief depredator, ably assisted by the woodpecker, blackbird, and wax-wing."

CULTIVATION OF THE QUINCE.

"Neglect of the cultivation of the quince," would be, perhaps, the more appropriate caption for the notice of that fruit. Useful as it is, both as a delicious preserve and for the flavour it imparts to other fruits and culinary niceties, it is, in this country, treated with almost contemptuous indifference. So much so is this the case that, according to the evidence, the demand, even in the Niagara district, exceeds the local supply, and quinces are actually imported from the United States.

The cause of the unpopularity of the quince, it is suggested, may be the long period they ordinarily take to arrive at maturity. But both Mr. Beadle and Mr. Allan suggest that want of proper care and cultivation have much to do with this, and that, with these, the time lost in the tree attaining perfection might be very much diminished.

Mr. Beadle says :—

“I believe the quince can be made a profitable fruit. The average yield of a quince tree is about half a bushel. They are not planted over six feet apart. They are long-lived trees, but are slow in coming to maturity, and I am inclined to think that that is the reason we have not given them a fair chance. They are generally stuck in amongst the fence corners, but I believe if they were properly cultivated and taken care of they would attain their full growth and begin to bear much earlier than they do now. From conversation with one or two gentlemen who have made some experiments, I should judge that the quince tree will respond to generous treatment as much as any other tree we have.”

Mr. Allan mentions that, where justice is done to the quince, it succeeds admirably. It bears regular crops, is long lived, and, except at times subject to a twig blight, is a healthy tree—although needing a milder climate than some—and yields half a bushel of fruit annually. The opinion of all the witnesses who referred to the quince was in favour of its larger cultivation, which it was believed would prove profitable to careful growers. The Orange variety is the one most frequently cultivated. The Orange and Angiers in fact are the only two sorts mentioned in evidence.

NAMELESS SEEDLINGS.

It is sufficiently evident that, scattered over the whole Province, are to be found seedling varieties of all the tree fruits, many of which possess great merits and eminent economical qualities. We hear of promising apples and plums at Lindsay; of apples, with a reasonable probability that seedling plums exist too, if only looked after, in the United Counties; of peaches in half a dozen districts; of seedling plums almost everywhere; and all these only suggests the extreme likelihood that numerous others abound of which these are but the occasional indications. Mr. Beadle alludes to one instance of this kind. He says :—

“I am persuaded that seedling peaches raised in our country will be hardier than the average of foreign varieties—in other words, that if our people will take the pains to raise seedling trees they will gradually get a race of peaches that will be hardier than trees from southern countries. There is a gentleman in Beamsville, Mr. Kilborne, who has planted quite a number of seedlings, mostly of the Crawford type. I went and examined his orchard, and found he had a number of very fine peaches—all of them, or nearly all of them, yellow-fleshed peaches, and I think amongst those there will probably be found some worthy of propagation. I take this for granted: that if you select the seed of a tree that is growing as near its northern limit as may be, and, if it perfects its seed, plant that seed and you will gradually grow a race of trees hardier than the parent. I demonstrated that in the case of Chinese arbor vitæ. My father imported a tree years

ago; he succeeded in getting it to live by protecting it; now it has borne fruit and seeded, and I have raised young trees from its seed that are perfectly hardy."

This applies, not only to the fact of valuable fruits being all but unrecognized, but also points to the very great utility of seedlings in the economy of fruit culture. Mr. Beall's efforts to acclimatize the plum have been already noticed, as well as the information he gave the Commissioners of the existence of seedling apples superior to the grafted varieties. Of seedling varieties of the peach in the Goderich district, Mr. Allan says:—

"We have a large number of seedlings. Years ago, every farmer had a number of seedlings, but many neglected to renew with better varieties or even seedlings. At present we are testing a number of seedlings, some of which give promise of excellent results. Mr. George Cox, of Goderich township, has grown a large number of seedlings from year to year, and among them he has four very superior ones, indeed they are equal to any of our known varieties in size and flavour, and exceed them in productiveness. They are all high coloured, juicy and rich; one has flesh strongly resembling Early Crawford, and flavour fully as strong; three are free stoned and one cling. They bring equal prices in our market with any of our best kinds; they ripen from about August 27th to September 8th or 10th. The trees are large and strong, very hardy and heavy, and regular bearers. I consider these four varieties well worthy of general cultivation, and being naturally hardy, they might succeed in locations where others fail."

The merits of a valuable seedling plum in the above section have been already alluded to. Mr. Westland, of Ridgetown, in Kent, refers to a seedling peach in his neighbourhood. He says:—

"We have one seedling peach in cultivation, but we have no name for it; it is a yellow peach, with red cheek and yellow flesh, and is of fine quality. The tree is very tough and hardy, and generally produces its own kind. I have grown it from the seed several times. It is not a large peach; it is about the size of the Hale, and has a very fine flavour. I think the tree is the hardiest of any variety of peach I know of; the foliage is small and dark, and the wood is a dark black; we have taken no means to propagate it. The people in our district are growing this particular seedling, and there is one orchard in which there are quite a number of trees, which have been bearing for a number of years; it originated, I think, with Mr. Edward Tyhurst; no steps have been taken to make it known, except in that neighbourhood. I am not a member of the Fruit Growers' Association, and I don't think that any steps have been taken to let that body know of its existence. I think the originator was at one time a member of the Association, but I cannot say whether he made the seedling known to them or not. The fruit ripens about ten days later than the Early Crawford."

Mr. Toll, from the same county, has also a seedling that deserves to be known and might be advantageously propagated. He says of it:—

"We have some seedlings, and I have a tree of one, whose fruit I would not give for almost any other fruit grown. The fruit is not quite so large as Hales', and its flesh is dark yellow on the inside. I have taken no pains to propagate the seedling. I think it would be well to propagate the seedling I have mentioned, as it is a good bearer and hardy. . . . I have not brought the seedling to the attention of the Fruit Growers' Association."

Mr. Usborne mentions in his evidence that he is growing twenty-six varieties of apples from seedlings in his county (Renfrew). The original trees, he says, "are all fine fruits."

In the course of their inquiries into farming operations in the County of Lanark the Commissioners heard of seedling apples of great hardiness and fine quality.

Where a seedling, which owes its origin to the merest chance, has taken possession of a district as its own, and flourished vigorously for years, it may be supposed to have exemplified the doctrine of the survival of the fittest, and to be especially deserving of attention and encouragement. No doubt, too, in many a fence corner or garden plot, are to be found representatives of most of the fruits, the value of which is only known to, and perhaps hardly known to, the fortunate possessor.

The Fruit Growers' Association has done a great deal to promote the cultivation of new varieties of fruits, and to ascertain the existence of seedlings of special merit, but, from the evidence before the Commissioners, it is only too apparent that this valuable organization has, in this respect, been unable to secure one tithe of the information it is desirable for the country to possess on such a subject.

Many of the owners of seedling fruits do not happen to be members of the Fruit Growers' Association, and there are persons, too, in the world, who are willing enough to receive one hundred cents in value for their dollar, and yet who fail to enter into the spirit of those who conduct the Society's operations.

It appears to the Commissioners to be most desirable that, possibly through the Fruit Growers' Association, there should be a direct inquiry by personal and competent agency, in the chief fruit growing districts of the Province at all events, as to the existence of notable seedlings, coupled with an examination into their merits, including quality of the fruits, and growth and productiveness of the tree. Prizes for seedling fruits have been frequently offered by the Fruit Growers' Association, and are annually offered by the Provincial Agricultural Association in the fruit department of their prize list; but while these, no doubt, are inducements to the larger growers and exhibitors, they probably do not affect individual and scattered possessors of seedlings to any great extent. Some special effort to reach such cases is clearly desirable.

CULTIVATION OF THE RASPBERRY.

Raspberry cultivation, more than that of any other fruit, is limited by the superabundance of the wild variety which grows in every part of the Province. But this is after all the most potent of arguments in favour of raspberry culture, and as the bush is gradually cleared up, and waste or neglected spots are brought under tillage or pasturage, the rivalry of the wild berry will gradually diminish.

This process is going on rapidly even in some of the comparatively new districts. Mr. Roy says in his evidence :—

“The wild raspberry is grown to an enormous extent, and around our region of country thousands of bushels were exported some twelve or fifteen years ago ; in fact all the Indians brought in enormous quantities of berries which were either made into raspberry vinegar or exported ; but now there is not one wild bush around the Peninsula for a thousand some years ago, and hence there is a great necessity for growing cultivated raspberries. For making vinegar, wild raspberries are fully better than the cultivated ones.”

Of the cultivated raspberry, among the red varieties, the most popular are the Philadelphia, Franconia, and Brinckle's Orange ; and of the black, the Mammoth Cluster takes precedence. In addition to these, reference is made in the evidence to the Antwerp, Clark, Highland Hardy, Hornet, Brandywine, Belle de Fontenay, Arnold's Diadem, Kirtland, Herstine, Turner, Niagara, Cuthbert, and Queen of the Market, all red raspberries ; and the Doolittle, Davison's Thornless, Gregg, Ontario, and Seneca, of black varieties. Nor have Mr. Saunders' hybrids, which partake more or less of the character and colour of both red and black, yet been mentioned, although they are very prominently referred to by some of the witnesses.

Of the first named red raspberries, Mr. Beadle strongly commends both the Philadelphia and Franconia for hardiness, and, if its colour is not so popular, the Philadelphia is “immensely productive.” The Franconia is spoken of by the same witness as of good quality. “Brinckle's Orange is one of the more tender of the Antwerp class.” It is yellow in colour with an orange cast. Mr. Dempsey finds the Philadelphia “the most profitable variety.” Mr. Beall, at Lindsay, grows the Philadelphia and Brinckle's Orange ; and had no variety winter-killed until last winter when the Philadelphia and Brinckle's Orange were nearly all killed. The season, however, it will be remembered, was exceptionally unfavourable, and winter-killing was the order of the day in many branches of agriculture besides raspberry growing.

Mr. Arnold places the Philadelphia first on the list of red raspberries. With Mr. Allan, at Goderich, the Philadelphia is “very productive,” and Brinckle's Orange “fair.” The Franconia is grown successfully. Although reputed to be somewhat tender, Brinckle's Orange is one of the two or three varieties cultivated by Mr. Bucke at Ottawa. This is doubtless owing to the deep snows which prevail during the winter in that district, which protect the canes from injury.

Mr. Roy says :—

“I think the Philadelphia is the most profitable. It sells the best. Brinckle's Orange is very fine but tender.”

Of the Philadelphia and Franconia Mr. Leslie says :—

“We have grown raspberries profitably, and have found the Franconia the best yet. It is an old variety, and sometimes winter kills a little. We find the Philadelphia reasonably profitable. It is hardier than the Franconia, but the fruit is soft and has not so fine a flavour.”

The Antwerp is referred to by Mr. Beadle as somewhat delicate, but as a progenitor of a number of berries hardier than itself. It is however mentioned by Mr. Bucke as one of his varieties at Ottawa.

The Clark is mentioned by Mr. Beadle for its colour, flavour, size, market qualities and productiveness, and as one of the hardiest varieties. He gives the last named merit as an attribute also of the Highland Hardy, of which he says:—

“There is another variety, the Highland Hardy, which comes in amongst the earliest of the red raspberries; it ripens about as soon as the strawberries are done, and is desirable as a link between them and the raspberries. Its qualities in other respects are medium.”

The Highland Hardy is one of the first, if not the very first, to ripen.

The Hornet is described as a French variety, “a large, handsome berry of good flavour, although it is a little tender.”

The Brandywine is also mentioned for its hardiness.

Mr. Arnold has two hybrids that appear in the above list, Arnold's Diadem and Number 10. He says of them:—

“They were crosses in the first place between the European raspberries of different kinds, and the white cap. The cross is one very difficult to make, and my final aim was to produce ever-bearing raspberries. Number 10 bears immense crops in the fall, but they are of no value, because there is then generally an abundance of other fruits, and they seem out of season.”

Mr. Allan speaks of the Diadem as one of the varieties hardy with him and not subject to winter killing. He includes the Kirtland in the same list.

The Belle de Fontenay is only mentioned incidentally as a well flavoured berry.

Among the witnesses examined was Mr. A. M. Smith, of St. Catharines, formerly of Drummondville, who makes a specialty of raspberry culture. He has at the present time probably some twelve acres under raspberries. As his experience, he gives the following, as the varieties he is planting in the order of their ripening: the Highland Hardy, Clark, Philadelphia, Herstine, Turner, and Niagara. Of the latter he says:—

“The Niagara was a seedling of mine. It was grown from seeds I selected from the Clark and Philadelphia growing together. The variety is probably a cross between these two kinds. It has a little resemblance to each of them. It is a red berry, a little dark, but not so dark as the Philadelphia. It is not so bright in colour as the Clark.”

Mr. Morris, of Fonthill, speaks highly of the Niagara, but gives a decided preference to a new berry not mentioned by any other witness.

He says:—

“The most successful variety of raspberries is a new one called the Queen of the Market. I would give the preference to this berry. It is red in colour. The Philadelphia cannot be compared with it in size at all. It is very large, firm,

and of good quality. There is another raspberry, called Niagara, that is very good too. It is a red berry, and originated in Drummondville. The Queen of the Market is an American variety. The Niagara, I think, is as productive as the Queen of the Market, and its quality is as good, but it is hardly as good a shipper. The Queen of the Market is nearer in size to the Franconia than any other, but it is larger than the Franconia."

The Black Caps.

Of the black caps the Mammoth Cluster is mentioned by nearly every witness. Mr. Beadle says of it:—

"Then there is the Mammoth Cluster which has a very thorny plant. It is a more vigorous grower than the Doolittle and has a larger berry, though it is not perhaps a more vigorous cropper. It ripens decidedly later than any of the others. It is hardy, showy, has been widely disseminated, and is as profitable as any."

It is one of the two varieties, the Ontario being the other, that do best with Mr. Dempsey. Mr. Beall cultivates the Mammoth Cluster at Lindsay. Mr. Arnold regards it as "the best of all blackberries." Mr. Allan reports it as hardy in his district. Mr. Morris classes it as one of the two best varieties.

The Doolittle is referred to by Mr. Beadle, who says of it:—"The Doolittle is a good berry, and very productive when properly cared for."

He adds the following caution:—

"If a person is growing plants and fruit at the same time, he may make a failure of the fruit, though he may succeed with the plants. They grow by the tops reaching over and taking root in the ground, and this seriously affects the fruit-producing qualities of the plants, but if a person will persistently prevent them from taking root by pinching off the tops the crop of fruit will be large and juicy, and will be also comparatively profitable."

Davison's Thornless berry is described as the earliest of the black caps. The berry is about equal to the Doolittle in size and productiveness and has the advantages of ripening early and being thornless.

Mr. Dempsey, however, says of it: "Davison's Thornless is a fine berry, and convenient for packing, but we find that the ends of the canes freeze in winter."

The Seneca is one of the varieties Mr. Dempsey cultivates.

The Gregg is mentioned by Mr. Morris with the Mammoth Cluster as one of the best of its class.

The Saunders Hybrids.

Mr. Saunders' Hybrids are spoken of in high terms by several witnesses:—

Mr. Dempsey says:—

"The hybrids are very fine. No. 55 with us will produce more berries than any other variety I have ever seen, though the fruit does not ripen all at once. Last year we had berries for the table for some weeks, and it is a favourite for home use on that account. I have never tried them for the market."

Mr. Arnold adds his testimony as follows:—

“Some hybrids of Mr. Saunders’ are quite superior to them all. They are crosses between the red and black, and are very productive and hardy. The flavour is between the two. Mr. Saunders’ hybrids are getting to take the lead in that class.”

Mr. Bucke, who tests the raspberry as well as other fruit under very severe conditions, gives a somewhat fuller notice of these valuable hybrids. He says:—

“The colour is rather against Mr. Saunders’ berry, but it is very prolific. I do not think Mr. Saunders has given his hybrid any name yet. It is a most wonderful hybrid, because it is such an intimate cross between two varieties which are totally distinct from each other. The characteristics of both parents are easily recognized in it. I have planted some seeds from it, and I have raised both red and black raspberries. It is from the seeds of this raspberry I expect the future raspberries of Canada will be grown. The two parents being natives, they will stand any climate. The fruit of the seedlings from Mr. Saunders’ hybrid are some of them larger than either parent. His raspberry is not very large, about the size of the Philadelphia, but it bears a heavy crop. We do not lay down Mr. Saunders’ hybrid raspberry or its seedlings, but we do the others. . . . Mr. Saunders’ raspberry was sent me from his first lot. I think there will be a large growth of it when it is better known, though it is very difficult to propagate. Mr. Arnold and myself hit upon a plan for its propagation, by laying down the canes, and as the branches grow we cover the old cane up and the new wood will take root.”

Method of Cultivating Raspberries.

In regard to the cultivation of the raspberry, Mr. Roy gives the following as his plan:—

“I grow my raspberries in hills eight feet apart, but I would advise them to be ten feet apart. They should be hoed, manured, and cultivated well. In each hill there should be four or six canes, and if you grow them to any extent you should run the cultivator through to keep down the suckers, and all useless canes, except the ones you intend for next year’s fruit. Leave only the strong, healthy, new canes; I think it is a good thing to keep them about six feet high. Don’t let them come up as high as eight or ten feet. You will have a better crop by keeping them lower. I don’t protect them at all in the winter, but some of the tender ones such as Brinckle’s Orange I have laid down under the snow, that is, laid them down and let the snow come over them. I have my raspberries eight feet apart each way. I plant them that distance apart for the purpose of being able to run the cultivator through them.”

Mr. Morris’ plan is a little different. He says:—

“In planting raspberries I would recommend them being planted in hills say three and a half feet one way and five feet the other; and only one plant in a hill. We do not prune red raspberries at all, just let them grow up, and tie them together.”

Mr. A. M. Smith, however, says:—

“My method of cultivation would be somewhat different from that of Mr. Morris. I do not tie up canes, but cut them back when young, and they grow stocky and self-supporting. I usually let some of the canes come up between the

hills. I remove the old wood just as soon as the fruit is off. I cut out the whole of the old wood immediately after picking the fruit. There is another point—I generally do my cultivating pretty early in the season, and try to avoid cultivating them after picking the fruit. This is to get the wood ripened up for winter. Sometimes it is necessary to go through and weed them out after picking.”

Mr. Leslie’s plan differs from either of the foregoing. He says:—

“We grow raspberries in hedge rows and pick them in pails, the same as wild raspberries, with the exception of the Franconia, which we pick altogether in baskets, like strawberries. The plants are placed eighteen inches or two feet apart, and the distance between the rows is about five feet, so as to allow a horse and cultivator to pass through. The old canes are cut out, and the cultivator passed through in one direction. Under this system the plants do very nicely, and seem more hardy and more productive than by any other.”

Any person who may contemplate raspberry cultivation on a large scale may be interested to learn from Mr. Smith that it costs about \$30 to provide the plants for an acre of raspberries, while the planting out and necessary preparation of the ground would cost from \$8 to \$10 more. As to manuring and subsequent cultivation, he says:—

“I usually manure my raspberries after they are planted. I use barn-yard manure and ashes, and apply them usually in the fall. Usually I scatter the manure around, and then run a light furrow, and partially cover it with earth. The cost of cultivating them after they are planted is not very great. You have to keep the ground clean and keep down the superfluous suckers. A man, with a horse, should cultivate four or five acres, doing the majority of the work with the horse and cultivator. My usual method is to cultivate them perhaps five or six times in the course of the season, and then I have three or four men to do the hoeing. I should think an acre could be cultivated for \$10 a year. The pruning would be worth \$4 or \$5 more.”

Mr. Smith was also good enough to go into some further details in connection with the production of his raspberry grounds and the cost attendant upon and mode of harvesting and disposing of his crop. He said:—

“The canes last usually five or six years. You can raise about 1,500 quarts a year on an average—I have raised 2,000 quarts—to the acre. Raspberries are often sold at 6 and 7 cents, but if they come in in very good condition they command from 10 to 12 cents wholesale. I would not think it profitable to cultivate a raspberry bed after five or six years. Picking costs about $1\frac{1}{2}$ cents a quart. We get the common baskets for $\frac{1}{2}$ cent each, but I have generally used a more expensive basket, which is much stronger, and the berries carry much better in it. These cost about 3 cents each. It would not pay to use them except we got them returned. I find it is better to ship the berries in pints when carrying them a long distance.”

On the basis of Mr. Smith’s figures, the profit and loss account of his operations would, under a fair crop, stand about as follows:—

Land at \$100 per acre, say interest at 7 per cent	\$ 7 00
Canes \$30, lasting six years, per annum	5 00
First cost of planting out, \$8 to \$10, or say per annum . .	1 50
Cultivation per annum	10 00

Pruning, say	\$ 5 00
Picking 1,500 quarts, at 1½ cents per quart.....	22 50
*Baskets, common, ½ cent each.....	7 50
	<hr/>
Total cost of raspberries per acre.....	\$58 50
Return, say 1,500 quarts, at an average of 8 cents.	124 00
	<hr/>
Profit	\$65 50

It must be recollected, however, that losses often occur from damaged crops, or from fruit that may not be disposed of in time to prevent a reduction in value from decay. Such contingencies have always to be taken into account when estimating profit and loss.

CULTIVATION OF THE STRAWBERRY.

The strawberry, in its wild state, is ubiquitous in this Province. It is in fact, so thoroughly indigenous to Canada that, says Mr. Bucke in his evidence :—

“It grows wild one hundred miles below Quebec City as well as it does in Western Ontario.”

Nor does it appear that the plant may not be cultivated successfully, and even profitably, in districts least favourable to the growth of the large fruits. It flourishes in soils of little value for most purposes, ripens rapidly under the influence of the early summer heat, is well protected by the abundant snow fall from the severity of winter, and has few enemies able to produce any serious impression on the crop. The only drawback to strawberry culture is the limitation of the market to a strictly home demand; the difficulty of shipping the fruit to long distances without injury, and the necessity for its early consumption after picking, being obstacles to a more extended traffic. Nor does there, at present, seem to be such a consumption for preserving purposes as, if carried out upon a large scale, might help to maintain prices and relieve growers of a surplus. While, however, these remarks apply chiefly to the great wholesale strawberry growing districts, in parts more remote, such as our northern, eastern, and north-western counties, it would be untrue to say that the limits to profitable strawberry cultivation have been reached or even approached. Attention will first be called to the evidence of some large strawberry growers, and afterwards the facilities for an extension of the industry will be noticed. The sandy soil of a large portion of the front or southern part of the County of Halton, and particularly the district surrounding the Town of Oakville, is the most famous for its strawberry gardens, of any section of the Province, while the short distance between Toronto on the east, and Hamilton on the west, with the most convenient and speedy communication by land and water with both cities, gives to the growers the best of markets almost close at hand, and ready

* If a more costly basket is used it is returned, or if some be lost, the above charge may perhaps cover such deficiencies.

means of distribution elsewhere, as far as the nature and condition of the fruit will allow.

Mr. Jeremiah Hagaman, one of the largest Oakville strawberry growers, was good enough to give the Commission very full information with regard to his business. The berry he, in common with most other witnesses, gives the first place to, as a market fruit, is the Wilson, or Wilson's Albany. Of this berry he says :—

“For home cultivation I consider the Wilson variety the best. It is preferable for marketing. Take it all around I think the Wilson is the best berry. I think there are some other strawberries richer and better than the Wilson, and more pleasant to the taste, but there are none of them that would carry or keep so well as the Wilson, nor produce so large a crop. So far as I know I think the Wilson is ahead of all. It is considered a first-class fruit, but of course it is a little tart. It yields more than any other berry we have had to do with, but we do not consider it the sweetest. We have not tried many of the lately introduced berries. A good many have been tried by others in Oakville, but they have not succeeded well . . The Wilson is a general favourite with all the great fruit growers.”

The Wilson is the chief variety grown in Prince Edward County. At Lindsay “almost everyone grows the Wilson.”

Mr. Arnold, of Paris, who has given a good deal of attention to strawberry culture, as will be seen further on, says :—

“The most profitable for the market is Wilson's Albany, and though there is one called the Ida that is a larger, finer, and better berry, Wilson's Albany carries the best of any.”

At Ottawa, “people generally grow the Wilson, because it produces a heavy crop.”

At Goderich, says Mr. Allan, “we cultivate the Wilson almost exclusively for market purposes.”

Mr. Pettit, of market varieties, prefers the Wilson. At Arnprior, Mr. Osborne “grows the Wilson exclusively and it does well.”

“The Wilson,” says Mr. Roy, of Owen Sound, “is most profitable for the market.”

Mr. Leslie says of it :—

“We have tried a great many varieties of strawberries, but do not cultivate them for market on a large scale, growing them mainly for the plant. The variety which we have found best so far is Wilson's Albany. It has rather an acid flavour as generally picked. It is not ripe when it is red, but must be nearly black before perfectly matured.”

In Bruce, the Wilson “is the favourite with local growers,” but the wild strawberry is a powerful competitor with the cultivated plant.

The Wilson is the popular fruit in Perth.

The same testimony as to its superior marketable qualities comes from Middlesex on the west, and the United Counties on the East. The Wilson owes the favour in which it is held, first to its ripening, or at all events attaining a

marketable condition early, second to its productiveness, and lastly to its carrying qualities. Its tartness is an objection with some, although not regarded as a drawback by many. But, as Mr. Leslie points out, it is not ripe when ordinarily sold. When fully matured it would be nearly black, but then its carrying qualities would be diminished. The Wilson, however, is not without rivals in the field.

Mr. Westland, of Kent, is of opinion that the Monarch of the West—

“Produces equal to the Wilson, is as good a shipping berry, and equally hardy.”

Mr. Dougall says:—

“The Wilson strawberry has been principally cultivated hitherto, but I think it is running out. It has also become so mixed by the fruit seeding that it is almost impossible to get the true Wilson strawberry anywhere. The Col. Cheney is a very profitable strawberry with us. The Sharpless Seedling is also a very fine strawberry—one of the finest. The Crescent Seedling is more profitable than the Wilson. The only objection to it is that it propagates too fast—it has too many runners.”

Mr. A. M. Smith says of the Crescent Seedling:—

“I don’t think I would plant the Wilson exclusively if I were setting out any plants. At present I think there is more money in a very early berry or in a very late one. Every one has gone into the Wilson, and if you could get a berry a few days earlier than the Wilson more money would be made. I think the Crescent Seedling is probably going to supersede the Wilson in many markets. I planted the Crescent a couple of years, and I am satisfied that it is ahead of the Wilson in bearing, but it is not as good a shipper. It is not so acid as the Wilson, being a sweeter berry. This fruit has been very cheap at St. Catharines this season, probably not more than four or five cents a quart. The Crescent Seedling ripens about the same time as the Wilson.”

Mr. Morris gives his view of the respective leading early varieties as follows:—

“For the market I prefer the Wilson, Captain Jack, Crescent Seedling, Sharpless, and Monarch of the West. The Sharpless is three or four times as large as the Wilson, and it has a better flavour. It requires trouble to raise it, nor can it be shipped any distance, and another objection is that it lies flat on the ground on account of the berries being so large. If I were planting out five acres I would plant a good many varieties. Of the lot I think I would prefer Captain Jack. It will yield more than the Wilson, and carry to market better, and keep its colour better. It is so much like the Wilson that they can hardly be told apart. In acidity it is about the same as the Wilson, and it requires moist ground. The Crescent Seedling, I think, is a very profitable berry. For farmers I would prefer it to any, because farmers neglect their berries, and this one will almost take care of itself. I think it will bear more than the Wilson. I should think strawberries produce about a hundred bushels to the acre. I think we shall in time have a sweeter berry which may be transported, but we have not attained that yet.”

Of other varieties the Triomphe de Gand and Jucunda are esteemed the most, for home consumption, by Mr. Beall. Mr. Arnold, after referring to the popularity of the two last named varieties with some persons, and mentioning a small berry, called the Mary Fletcher, which has “the highest flavour of them all, but is not so

productive," alludes to the Wilson's Albany in the terms already quoted and then says:—

"Next to it I would place one called the Alpha. It is a splendid grower and very early. I have made experiments in crossing strawberries. I have sent out four this year. At the request of Mr. Downing, of Newburg, I have named one the Bright Ida, another the Alpha, another the Maggie, and another Arnold's Pride. Arnold's Pride is rather inclined to be late."

Mr Allan, of Goderich, says :

"For home consumption we prefer the Triomphe de Gand, Monarch of the West, Sharpless, Green Prolific, Colonel Cheney, and the Charles Downing, with a preference for the first-named. Arnold's No. 3 is also well thought of. We have not had much experience with the Sharpless, but I don't think it bears out the claims that have been made for it as to its enormous productiveness. I don't think any of these varieties would be likely to take the place of the Wilson, as a market fruit. The Wilson is the only strawberry that is shipped, though some of our growers have been asking for the Triomphe de Gand. Steadily through the season, the finer varieties command a higher price than the Wilson."

Mr. Bucke, of Ottawa, says :

"The New Dominion is an excellent berry, and is grown a good deal. I have some of Mr. Arnold's varieties. Some of them are exceedingly fine. His No. 23 is going to be one of the best ever produced, I think."

Mr. Leslie says:—

"The Sharpless is a new variety, bears very large fruit, is a good grower, and I think is a very promising berry. The Jucunda is one of the very best varieties and ought to be more cultivated than it is. It is a magnificent berry for shipping, the fruit being large and beautiful, and the plant productive and good in every respect. The Crescent seedling is very productive and the berry rather attractive."

Mr. A. M. Smith mentions some other varieties. He says:—

"There is one we have cultivated called the Nicanor, that, as an early berry, has paid very well about Drummondville. I have a seedling of my own that is a little ahead of that in the quantity and quality of the fruit. It has not yet been out under any particular name, but is simply grown there by one or two parties. It has been proposed to call it the Early Canada. I have had some experience with the New Dominion berry. For the local market it is a very fine berry to grow, but it is too soft for shipment. It is later than the Wilson, and will command a much better price. It is a seedling that originated in Drummondville."

Mr. Hagaman, in his answers to the questions put to him, gives what may be regarded as a full code of instruction for strawberry culture:—

"The soil most suitable for the growth of the berry is a sandy soil, or sandy loam. The ground should be highly manured, and if it were summer fallowed it would be preferable; or you can raise turnips, or something like that, and the next season raise strawberries. I would recommend summer fallowing, or a root crop, to precede the planting of strawberries.

"The vines should be planted from the first to the twentieth of May. I prefer spring planting to fall planting, and very seldom plant in the fall. It does not pay to plant in the fall. You have to protect them through the winter, and

then, in the spring, they are worth no more than those planted in the spring. They have to go through another season's operation before you get any fruit from them.

"Where the land is well prepared I would plant four feet between the rows and two feet in the rows. I do not recommend the hill system of culture at all. I don't think it has any advantage for amateur work.

"The vines should be renewed once in two or three years; by many it is considered well to renew them every year. I think it is best myself to take only one crop off them. The extra quality of the crop would repay replanting every year.

"After the first year's picking the fruit is not so good and it is generally smaller. I would not replant on the same piece of ground, but would select a new piece."

Mr. A. M. Smith agrees generally with Mr. Hagaman, but suggests one or two additional points.

He says:—

"I prefer a sandy loam for the growth of strawberries, and prefer planting the berries always in spring. I would not advise planting all varieties in rows. I think the Dominion will succeed better in hills. I think you will get finer fruit by adopting the latter method. Between the rows I usually plant about three and a half feet apart and allow them to spread. If I were planting in hills I would plant about three feet between the rows, and the hills about one foot apart. In the row system I would not think of picking more than two crops, and if the ground was any way foul I would not take more than one crop."

Mr. Dempsey, who grows strawberries very largely and under somewhat different climatic conditions from either of the previously quoted witnesses, says:—

"Strawberries will succeed anywhere almost, if the land is properly cultivated and drained. We cover them in winter with straw, and do not remove it in spring. We part it a little to let the plants through, and the straw prevents the berries from getting into the sand. I don't think that the aspect makes any difference in raising strawberries."

Mr. Allan adds a further practical suggestion:—

"The yield of the last part of the season's crop can be largely increased by working the soil and feeding with some fine manure and giving abundance of water, this could only be done to advantage by amateurs, as the labour of going over a large field would be too great. In a family plot, the season can in this way be prolonged, the yield materially increased. I know of no crop that can be grown in a family garden with so much satisfaction as strawberries."

He goes on to say:—

"A good, well cultivated, mellow soil is most suitable for the growth of strawberries, but they will succeed on various qualities of soil, so long as it is well worked up. Some small growers increase the last part of their crop by working the soil after the first berries have ripened. If it is dry weather the plants should be well watered. The vines may be planted either in the spring (when they will give a full crop next year if well taken care of), or they may be potted from runners in August, in which case they will give a fair crop the next year, and a full crop the following year. For field cultivation I would leave sufficient space between the rows to permit of a horse scuffler being used. In the rows the plants

should be fifteen to twenty inches apart. Some put them twenty inches and let them renew themselves between the plants, taking out old ones and leaving the new. The chances are, however, that the new crop would not give so good a yield as the old one, the distance being too small to allow the new plant surface food enough to produce a crop equal to the older plants. Strawberries feed from the surface soil only, hence the necessity of a frequent change of the bed. The hill system of culture does very well for amateurs, but when profit is looked to the row system is best, as it gives a much larger average crop, although not always such large berries. I think the vines should be renewed after two full crops."

The yield of strawberries per acre is variously stated. Mr. Dempsey puts it at from 2,000 to 3,000 quarts of the Wilson, realizing generally seven to eight cents per quart. Mr. Arnold has grown, he says, 300 bushels to the acre, but the average in favourable seasons would be about 75 bushels or 2,400 quarts to the acre. Mr. Allan puts the yield of the Wilson as high as 5,000 quarts per acre taking one year with another, and quotes the prices according to period of season at from six to ten cents per quart, with more for choice varieties. Mr. Hagaman mentions 75 to 100 bushels as the probable annual result of proper cultivation. Mr. Westland fixes the yield in favourable seasons at 200 bushels per acre or 6,400 quarts, and the price all round from ten to fifteen cents. We have one higher estimate still in a statement in the report from the United Counties, that in favourable seasons the Wilson has been known to yield 8,000 quarts to the acre. There can be no doubt that there are occasions when the crop is almost unlimited, but the prospective strawberry grower will probably be wise in taking some such estimate as Mr. Dempsey's, Mr. Arnold's, or Mr. Hagaman's as the basis of his calculations. The effect of their evidence is to give from 2,000 to 3,000 quarts per acre, as a season's crop under ordinarily favourable conditions. Taking 2,500 quarts as the yield, at seven cents, it gives a gross return of \$175 per acre. The cost of planting, as gathered from the evidence, would be about as follows:

Planting an acre, including plants \$35, or allowing the plants to last two years	\$17 50
One man to three acres from spring to September, say five months, at \$1 per day, \$150, or per acre.....	50 00
Picking, one cent per quart, say 2,500 quarts.....	25 00
Baskets one-half cent each.....	12 50
Add twenty-five loads of manure at fifty cents, \$12.50, or per acre	6 25
	<hr/> \$111 25

Leaving a profit of \$64 per acre, exclusive of cost of marketing, and loss from weather and other casualties.

Of course, by continuous replanting from the offshoots of the original plants a large item in the first outlay may be saved, and in cultivating on a large scale the cost of the labour per acre may be reduced, but three acres will probably demand the pretty close attention of one man per season, say from May to September.

It is only necessary to allude, in conclusion, to the opening for the extension of this industry. With the present and rather increasing cultivation of the strawberry, on the front and in the Lake Huron district—some 126,000 baskets being shipped from Oakville alone annually—the competition is already brisk, and prices often rule very low. But in the northern and eastern sections of the Province, there is room enough for a large addition to the number of growers and the area cultivated. Mr. Beall, at Lindsay, says on this point:—

“From the soil I think it would be profitable to increase the cultivation of strawberries, not only with us, but as far back as Haliburton, where they can grow a far better sample than we can. We grow a better strawberry than those coming from the front, but ours ripen later, and the further we get back the better we find the fruit, but it is still later. The wild fruit is common, but little of it is gathered.”

Mr. Bucke, of Ottawa, remarks:—

“The dry soil around Ottawa, where the water does not lie, is very desirable for strawberry culture. We import large quantities of strawberries into Ottawa every year, but there is no necessity for doing so if people only knew it. By the investment of a little capital, the selection of a proper soil, and the exercise of ordinary care, the district might become a vast strawberry field.”

There does not appear to be any sufficient reason why strawberry cultivation should not be largely carried on along the whole line of the Ottawa in the counties of Prescott, Russell, and Carleton, the railway facilities now existing giving cultivators an excellent market at Montreal if they have any surplus to dispose of.

CULTIVATION OF BLACKBERRIES.

The cultivation of the blackberry does not receive a great deal of attention from Ontario fruit growers. The wild thimbleberry is a powerful rival for public favour. The New Rochelle or Lawton was the first blackberry to attract attention, but it has been largely superseded by another variety, the Kittatinny, a fine berry, very productive and well esteemed. The Snyder is a smaller but hardy variety. The Early Wilson is also a good berry and ripens earlier than the others. The blackberry requires a strong soil. Mr. A. M. Smith says of the cultivation of the blackberry:—

“I have cultivated blackberries to some extent, and find the Dorchester and Kittatinny are the best. Sometimes the latter variety are affected by winter. They are a profitable crop. I intend planting more extensively than I have done. Blackberries yield more than raspberries, probably 2,000 or 3,000 quarts an acre. The average price is higher than raspberries, while the price of planting them is about the same. For one or two years there was a kind of blight on one of my varieties. I could not discover an insect, but just before the time of ripening my canes blighted. For the last two years they have been exempt from it.”

CULTIVATION OF THE CURRANT.

The currant is an indigenous plant, although the wild variety does not, like some others, enter into competition with the cultivated fruits in our markets.

The principal varieties of red currants are known as the Red Cherry, La Versailles, and the Victoria. Mr. Beadle appeared to be under the impression that the two first named were identical, but this view was not acquiesced in by other witnesses. The Red Cherry currant he regards as the most popular. The Victoria Mr. Dempsey considers inferior to both the others mentioned, while Mr. Arnold gives the Red Cherry currant the first place for size and productiveness, but claims it for the Victoria in point of flavour.

Of the white currants the White Grape is practically in possession of the field.

Of black currants the Black Naples is the most popular, but it has a very powerful competitor in Lee's Prolific, an English variety, which Mr. Leslie regards as superior to the Black Naples. The latter suffers too, at times, by its name being assumed for inferior and spurious varieties.

The red and white are profitable to the cultivator wherever there is a fair local demand, although subject to some drawbacks in the shape of insect depredators from which the black currant is partly free. They will be noticed in due course. For black currants there is always a market, and unless, now and then, a late frost nips the blossoms, the crop is a very sure one. Large quantities of black currants are used in confectionery, the price paid in Toronto being usually \$4, and never known to be less than \$3.50, per bushel. The average yield is about a quart a bush, or, at the rate of some 80 bushels to an acre, realizing at \$4 the handsome sum of \$320 as the gross return. Against this would, of course, have to be charged the cultivation and picking. The original cost of the plants would be about \$108 per acre not including planting. The trees are usually transplanted at two years, and if reasonably well cared for will last for ten years, or longer if skilfully and liberally managed. They may be planted four feet apart each way, or a little more space may be allowed, if room is not an object. The black currant will do well on almost any soil, but Mr. Leslie recommends that, if the soil be light, they should be well mulched the year round. They will bear any amount of manure—good stable manure being preferred.

From the evidence, more particularly of Mr. Leslie, there would appear to be room for an increased cultivation of the black currant, with a prospect of good profit to the careful cultivator.

CULTIVATION OF THE GOOSEBERRY.

The gooseberry is a native plant growing very freely and yielding in its wild state in some situations a very fair sized fruit. Of the cultivated varieties only the American sorts can be depended upon for a safe crop, the tendency to mildew being a serious and well nigh fatal objection to the European varieties. Cases have

been known to the Commissioners of the English berry of the White Smith variety doing well, while in the same grounds, but, perhaps in a rather less favourable soil, the American berries were dropping mildewed from the bushes; but such an occurrence is exceptional. With regard to gooseberry culture in Ontario, Mr. Beadle says:—

“There is no difference, I think, in the opinion of botanists, between English and American gooseberries, but there is a difference in their adaptability to our climate. The American gooseberry is a native of this country; it is found growing wild. Those gooseberries that have succeeded here, so far, have been developments of the indigenous plant. The amount of salt in the atmosphere of Great Britain—owing to its insular position—helps to keep up the humid state of the atmosphere. I know that in Nova Scotia and New Brunswick, within a certain distance of the sea, there is a belt in which the English gooseberry can be raised in perfection. The portions of Canada, where they have been cultivated with success, have been very limited. They have always been nearest the shores of lakes or rivers so far as I know. So far as my knowledge goes, attempts to grow the gooseberry inland have been failures. The wild gooseberry grows in dry situations. Practically then the gooseberry of America is one that ought to be cultivatable in every part of the continent. Very little has been done as yet in the way of gooseberry culture. Our Association distributed a plant of the Downing gooseberry to each member, for trial, owing to its exemption from mildew; we have reports of results to a limited extent. We have failed in the way of getting results of observations, and our members have been contented to enjoy what they received, and keep the knowledge to themselves too much.”

Mr. Beadle has found that, by sprinkling a strong solution of salt under the bushes, the humidity of the soil has been kept up, and mildew avoided. He regards the culture of the gooseberry as still in its infancy, and this view is probably a correct one. The English gooseberry is the larger and richer fruit by far, and if, by judicious management, a gooseberry can be produced approaching to the English varieties in their characteristics, but, at the same time possessing the resistance to mildew of the indigenous plants, the cultivation of the gooseberry will be far more popular and extensive. For canning purposes, Houghton's seedling is probably the best, Downing's seedling, and Smith's Improved, being the leading varieties for general use. The White Smith is the most favourably inclined of English varieties. It must be planted on a heavy clay soil.

THE CRANBERRY.

For marketable purposes, the cranberry can hardly be said to be cultivated; the supply of the wild berries being sufficient for the demand. They grow in marshes or situations that are flooded with water in the spring of the year. In the Dunnville marshes, and in the Trent valley, they are produced in enormous quantities. Mr. Dempsey mentions in his evidence that in gardens at Picton, the cranberry was cultivated for private use, and they were the largest he had ever seen. Whenever the time comes that the draining of the marshes, or other causes, cut off the supply of the wild fruit, some artificial means of flooding cranberry grounds will be found profitable and even necessary to cultivation.

CULTIVATION OF THE MELON.

With a few extracts from the evidence on the cultivation of the melon, the report on the subject of fruit culture will be brought to a close. Mr. Dempsey says on this subject:—

“I have paid a good deal of attention to the cultivation of both water and musk melons. Among water melons, I esteem the Long Island very highly, though it is not so early as some others. The flavour is very good. Phinney's Early is the first to ripen. The melon crop may be made a profitable one by studying the business closely. We may grow a fine crop of melons one year, and they are much sought after, and next year we will find the majority of the farmers going into their cultivation too, and I find that, though excessive competition may oblige one to occasionally sell at a loss, it does pay to continue their cultivation for the purpose of driving out the over-competition as the prices then become remunerative. The average yield per acre varies very much. I have seen about ten tons per acre, but that is a large crop, and the average would be perhaps about six or eight tons. I also cultivate musk melons. For the table I esteem the White Japan and Skellman's Fine Netted. The Nutmeg musk melon is more profitable for the market. They ripen with us about from the middle of August to the first of September. We usually manure them with rotted manure in the hill, about a shovelful, and sometimes a handful of superphosphate with a little salt thrown in the hill. They should be kept constantly hoed afterwards, and well earthened up under the leaf so that the seed leaves are lying flat on the earth. The borer is not very destructive. There is no insect that injures melons except a small yellow striped bug. I prefer to grow the fruit on sandy soil.”

By pursuing a proper method, the cultivation of the melon is very successful, even in the least favourable sections in a climatic sense. Mr. Bucke, of Ottawa, says:—

“We cultivate musk melons. The Montreal Nutmeg and the Cantaloupe are esteemed. The Japan melon is also thought highly of. We get the fruit to ripen early here; we have ripe melons about the end of July or the beginning of August. They are grown in hot-beds, in pots, or on reversed sods, and when the plants get from four to six leaves on them they are put out into beds of, say, four plants in each, with a wheelbarrow load of hot manure under them. Sashes are then put over them, and in this way the plant receives no check from the time the seed is sown until the autumn frosts. The striped beetle is injurious to the plants. A dark, shaly soil is preferred to light sand for melons, as it attracts the sun's rays.”

The remainder of the evidence does not add much to that already quoted in this connection. All the gourd tribes flourish in this Province, and their cultivation is a matter only of discretion and common sense.

CONCLUDING REMARKS.

The Commissioners believe that the review of the evidence they have now concluded, will demonstrate to everyone, whether the fact has been hitherto admitted or not, that the Province of Ontario is pre-eminently adapted for the

growth of fruit, subject, of course, to a wise selection of soil and situation, and the particular description or variety of fruit best suited to either, or to the markets open for its consumption. What has here been said has been addressed, not to the skilled pomologist, but to the farmer, and it has been for his benefit that the mass of evidence has been obtained. The knowledge and experience of trained experts have thus been gratuitously placed at his disposal. Hitherto it is quite probable that, to the farmer who has grown a small quantity of fruit, the business has not been very profitable. It has been looked upon as a mere incident to the possession of so much land, or a means of supplying the wants of the family. What has been planted has often been planted without judgment in the first selection; what has been grown has been inferior because uncultivated, and left to chance; what has been marketed has been profitless because ill-gathered, or damaged by insects or rough usage. It is, however, sufficiently evident that care and attention will pay, and pay handsomely. Nor can the effect of so interesting and delightful a pursuit as fruit culture, carried out on intelligent principles, on the younger members of the farmer's family, be unworthy of consideration. The laying out of the orchard; the cultivation of the protecting hedges or tree belts of attractive evergreens; the care and pruning of the young trees or bushes; the occasional efforts at obtaining new varieties; the study of the habits of the insects that frustrate success, and the efforts to circumvent these cunning pests; and finally, the repayment for a toil and care that has little of drudgery about it, in the creation of an orchard or fruit garden, giving beauty to the homestead and bringing substantial pecuniary returns besides—all this may surely be one means of arresting the tendency of farmers' sons to seek other pursuits, and, in overcrowded cities, find too often a far less certain if more exciting means of employment.

On three points before they leave this branch of their duties, the Commissioners desire to record a strong opinion:—

First.—They recommend that a plan should be adopted for the periodical collection and compilation of fruit statistics, and of such facts as show the state or progress of fruit culture in the several sections of the Province.

Secondly.—That a special means, should, as already suggested, be provided for ascertaining from time to time the existence of new varieties.

Thirdly.—That a hand-book of information on Fruit-growing, as free as possible from technicalities, which would at the smallest cost instruct everybody who desired to know what fruits could be grown, what varieties are most profitable, and when, where and how to grow them, should be prepared, under proper authority, for publication.

CHAPTER III.

CULTIVATION OF THE GRAPE

AND

NATIVE WINE MAKING.

Although nature had marked out this country as the home of the grape, its cultivation on a scale of any magnitude has been a thing of quite recent date. As stated in a previous portion of the Report, the grapes of Canada are all descendants of the two indigenous varieties, known respectively as the Fox and Frost grapes, crossed together or with European wine grapes.

The Fox and Frost grapes are found over the whole of this Province, except in the Muskoka and Parry Sound District, but it is stated in the report of the Commissioners, who visited that section of country, that the wild grape of one or other variety makes its appearance as Lake Nipissing is approached, where a somewhat milder climate prevails than in the more southerly parts of the district. The absence of lime is reputed to be one cause of the absence of the wild grape in Muskoka, and probably this defect has been supplemented by the action of spring frosts on the vines if any have ever taken root there. The cultivated grape, on the other hand, was seen to be flourishing vigorously in many parts of the district, and bearing a good crop.

The Frost grape is the smaller and finer leaved variety of the wild grape, and it owes its name to the beneficial effects of frost on the maturing crop. Of this species the Clinton is one of the improvements.

The Fox grape is the coarser leaved grape, its berries being larger, but more sparsely distributed, not hanging like the Frost grape in thick clusters or bunches. It is more sensitive to frost than the Frost grape. From the Fox grape crossed with the best European varieties Rogers' hybrids have been produced.

The failure to fruit is common to both, owing to the plants in a wild state bearing only male blossoms. It is probably a grape of the Frost variety that is mentioned in the report from the United Counties, which says:—

“Native wild grapes, some of excellent form and quality, grow everywhere throughout these counties, and on the St. Lawrence islands on the dry limestone

gravelly hills and ridges, the soil being deep and strong. On the edge of a large marsh, where the vegetable soil was deep and rich, a fine vine (native), heavily laden with splendid clusters of a grape, at least equal to the Clinton in size of bunch and berry flavour, has been seen by the writer of these notes."

The European grape, on the other hand, whatever its value as a cross on the native grape, has never thriven on this continent. Mr. Beadle, in his evidence, was very emphatic on this point. He said:—

"Many attempts have been made to plant the European grapes in Canada. The vines will grow for a while, sometimes they will bear a crop or two, but in the end they will all succumb to the mildew. During the winter I received an inquiry emanating from the Commissioner of Agriculture about some parties abroad bringing in and planting European grapes, and I replied it was utterly useless; that the experiment had been tried and proved a failure, and that it always would prove a failure."

A similar experience, nearly as unsatisfactory, it will be recollected, has attended the efforts to acclimatize the European gooseberry. It is, however, a source of great satisfaction to know that, thanks to the skill and perseverance of American and Canadian hybridists, we have been supplied with grapes of great excellence, and possessing most, if not all, the qualities necessary either for table use or wine manufacture, capable of cultivation, some or other of them, in all parts of the Province, and very free, so far, from injury by destructive enemies.

Speaking of the area best adapted to grape cultivation, Mr. Haskins of Hamilton, who, with his partner, owns a large vineyard there, says:—

"I have been engaged in the culture of grapes for twenty-one or twenty-two years, and have had a good deal of experience with such varieties of grapes as are suitable to our district. The district embraces Hamilton as its centre, and the area between Hamilton, Niagara, and some distance round on the north side of Lake Ontario. The area of Canada adapted to grape culture is very large, and I think would include all that part of Ontario south of the Great Western Railway, and some distance north of it. Taking from this city (London) westward, and south to Lake Erie, we would include some of the best grape growing lands in the Province. I understand that in Kingsville, Essex County, the Catawba may be ripened and taking that as a test it is a better locality than Hamilton. A friend who resides in Ottawa, an enthusiastic grape grower, told me, that certain varieties of grapes ripened there, and I was surprised to learn that the Delaware was one of them. There are very few points in the vicinity of large bodies of water where grapes cannot be grown. From my own observation, and from what I have heard of Prince Edward County, I think it would be an excellent place to grow the earlier varieties of grapes. Grapes are a great deal cultivated in the district lying between Hamilton and the Niagara River, vineyards being attached to many houses, and planting is going on yet."

Grape growing is successful in all the western counties. There are large numbers of grapes grown in the immediate vicinity of Toronto, and all along the line of country lying between Toronto and Galt. Nor is the suggestion that grapes may be cultivated on a large scale, and profitably, at Ottawa, at all beyond the limits of actual experience. At Arnprior, in Renfrew, the Commissioners

found a very fine vineyard in cultivation by the Renfrew Fruit Company. Their manager, Mr. Usborne, says in his evidence :—

“We grow grapes largely. We have fruited this year some thirty varieties. Among others the Delaware, and Champion are early grapes; Rogers’ Nos. 33 and 19, the Martha, the Walter, the Concord, and the Telegraph, are useful varieties. I would not recommend the Clinton. We grow forty-one varieties altogether, chiefly with a view to fruit, thirty-five of which we have ripened successfully this year. We have made some good wine—champagne, and some light dry wines. We have to lay the vines down in the winter and keep them covered with soil to protect them from the spring suns. We already suffer from the curculio on the plum; we adopt jarring as a means of checking them.”

Mr. Beall, at Lindsay, says :—

“As to grapes, the Delaware, the Concord, the Clinton, the Creveling, the Rogers’ Nos. 4 and 15, and the Champion, have all been grown in our neighbourhood, and have fruited. They do much better than any other varieties that I am aware of. The Concord, the Delaware and the Clinton ripen the earliest. I do not like the Champion myself, and would not grow it. I agree with previous witnesses as to the pruning of grapes. I think they should be pruned in the fall and then pinched in the summer.”

The principal varieties of grapes, mentioned by the witnesses examined in connection with grape culture were :—

The Delaware.

Concord.
Clinton.
Rogers’ Hybrids.
Allan’s Hybrid.
Hartford Prolific.
Champion.
Creveling.
Arnold’s Brant.
Iona.
Burnet.
Duchess.
Moore’s Early.
Prentiss.

Niagara.

Diana.
Adirondack.
Isabella.
Alvey.
Merrimac.
Agawam.
Tallman.
Martha.
Brighton.
Massasoit.
Pocklington.
Wilder.

and several un-named seedlings.

Some of these receive but a passing mention. The Diana, Isabella, and Adirondack are referred to by Mr. Haskins, who says :—

“The Diana is an old grape which many people overlook, but I think it is a very fine one. It ripens well with us if the vine is not allowed to grow too many clusters. It will keep until after Christmas. Some seasons it ripens irregularly, which is a serious draw-back. The Adirondack is a very fine grape, but too tender. The vines must be covered every winter with earth, and then we are not always sure of a crop. It is a delicious, juicy fruit. The Isabella I have fruited for several years, and, somehow, it degenerates. When we plant first we get a good crop, but in after years we find that we cannot ripen it. The leaves will strip off and the fruit hang without ripening. I do not think it is a desirable variety to grow.”

The Alvey, is alluded to by Mr. John Hoskin, of Toronto, who says :—

“The Alvey is a grape which few have in Canada. My father-in-law and

a gentleman near St. Catharines, and one or two others, I believe, are the only ones who cultivate this grape. It came from the States, and is well known there. After reading descriptions of the various grapes I selected that variety as the best that could be used for this country. I was doubtful at first whether it would ripen in time, but I find it ripens a little too early if anything. The birds carry them off. It is not so prolific as the Delaware. Richness and flavour are the qualities of the wine made from it. These two or three ideas I have mentioned are merely for the benefit of people in Canada who feel disposed to make wine."

The Merrimac and Agawam, are alluded to by Mr. Hoskin, as being useful additions with others to his red wines, and the Agawam is a favourite of Mr. Beadle's, "because of its peculiar musky flavour." "It comes," he says "nearest to the Muscat of any of our grapes."

Mr. Beadle speaks of the Tallman as identical with the Champion, although that, he says, is a disputed point. The Beaconsfield, he describes, as the same grape as the Champion. Any good white grape which may prove to be hardy and productive will probably be next in point of profit. The Martha, Mr. Beadle alludes to rather disparagingly. Mr. Dempsey has had no experience in the Brighton, having only fruited it once. Of a group of seedling varieties, Mr. Beadle speaks as follows:—

"I know of a large number of seedling grapes that are not in general cultivation, and some of them promise to be good. There is one known as Moore's Early, which was originated by John B. Moore, of Concord, Massachusetts, from seed of the Concord grape. It promises to be a valuable early grape. How hardy it will prove can only be known when it has been tried. There are two or three white grapes which promise to be of value. One is called the Prentiss, another the Niagara, another the Duchess, and another the Pocklington. They are all candidates for popular favour."

Mr. Haskins thus alludes to his experiments:—

"I have experimented a good deal with new varieties, both seedlings from standard sorts, and also hybrids. I have had very good success, and have now some varieties which I consider very promising. I have been particularly successful in raising white grapes, and I have varieties which I consider superior to the Rebecea, principally because they are more prolific and hardy and more of a field grape than it is. I have one white grape similar to the Sweetwater and as hardy as the Delaware; and another one which is a white Delaware and very hardy. I have a third white one which has foliage almost as good as the Concord, and fruit transparent and of an excellent quality, and very large. I have also two black grapes which I consider very promising. These varieties have been selected out of hundreds, the rest having been discarded. I have one black grape, a seedling of the Creveling, which is a better and sweeter fruit, matures earlier, and sets good bunches. It is a fine hardy variety, and is a good grape, either for table or wine. I think the production of new varieties of grapes is in its infancy, and that we will yet be able to introduce new varieties which will rival the French grapes, and enable us to produce more wine to the acre than they can in France—in fact we can almost do so now."

"I also like," says Mr. Beadle, "the Massasoit for an early variety. The Wilder is another—a black grape."

The Burnet is a grape highly thought of by grape growers. Mr. Dempsey, who has attained a high reputation in connection with the hybridization of grapes, is the originator of the Burnet. He says of it, and of his operations generally :—

“I have raised large numbers of seedling grapes of my own from crosses. I have planted the Burnet and No. 23 largely. The latter is a white grape, a little late, but it ripened last year with us. I have fruited about twenty varieties of seedling grapes. We describe them as quickly as we ascertain that they are good for anything. Our highest number is 60, but it would not be possible to tell you how many I have fruited, as there are some intervening numbers that never fruited. In order to test a grape for its fruit, it should be fruited more than one year, as sometimes it will be very superior the first year and yet fail the next year. They don't generally show their best points at first, but may gradually develop afterwards. In my experience that remark applies to other seedling fruits besides grapes.”

Mr. Arnold, of Brant, remarks :—

“I have a very high opinion of the Burnet grape from what I have seen of it in other localities.”

Mr. Arnold is also a distinguished hybridist. He refers thus to one of them —Arnold's Brant :—

“The Brant is one of my hybrids. Its parents are the Clinton and the Black St. Peter's. I place it first because it is the earliest among the Frost grape family. The grapes of this family hang until the frost comes, and they are improved rather than injured, while Fox grapes are injured by the frost.”

Mr. Allan, of Goderich, remarks that Arnold's Brant is “useless unless it gets a frost.”

Of most of the more popular and established varieties the notices are frequent. Of Rogers' hybrids Mr. Haskins says :—

“The varieties that have succeeded best with us are all of Rogers' hybrids, except No. 1, which is too late to ripen. Rogers' No. 4 is a fine grape, delicious and prolific. No. 1 is a white grape, but it would be of no use to try to grow it with us. No. 3 is a very early grape. It does not set a full bunch always, though it is worth growing. No. 9 is a very nice grape, but it is a shy bearer, and so is No. 3. There is a peculiarity about the young wood of No. 9 with us. It is of a red tint, and the same tint is carried into the fruit. The next one that I know of is No. 15, which is a very rampant grower. It will do well on trellises, but if it is cut back it will not do so well. The Salem is said to be Rogers' best variety, No. 22 I think it is. When it can be grown in a sheltered position it is a delicious grape, but otherwise it does not do so well. I have not been able to grow it successfully in the field. No. 33 is a black grape, liable to mildew, but very good when it escapes the mildew. Rogers' hybrids were originated by crossing the wild Fox grape with imported varieties. I think Allan's hybrid was introduced before Rogers', and it was said to be the only cross at that time between the native and foreign grapes. Afterwards came Rogers' hybrids. A great many have been trying to hybridize since Rogers was so successful.”

Mr. Dempsey has “planted a good many of Rogers' red varieties on account of the high prices they command. Red and white grapes have commanded about

double the price of black grapes for the last two years." He recommends Rogers' Nos. 3, 4, 9, 15, 22, and 44.

Mr. Arnold says:—

"For home consumption and dessert purposes I esteem the Brant, Rogers' No. 3 and No. 15, and there are a number of Rogers' other seedlings which are very good, all strongly resembling each other."

Another reference to Allan's, and also Rogers' hybrids, occurs in Mr. Dempsey's evidence. He says:—

"We had the mildew last year to a considerable extent on some of Rogers' hybrids and Allan's hybrid, and it extended even to a Martha which stood close to Allan's hybrid. I never saw the fruit rot on the vine except a few specimens last year; indeed it could scarcely be called rot, it was rather that the fruit seemed to cease growing. Insect enemies do not damage our grapes to any extent worth speaking of; the robins, however, are very destructive."

Of the Hartford Prolific and the Champion, Mr. Haskins speaks as follows:—

"The Hartford Prolific I do not like, but many people prefer it because it is so early. It produces large bunches, but on the first cold night the berries will all drop off. With us it ripens about the last days of August, or the first days of September. There is a similar grape to the Hartford, the Champion, which came out lately, and I believe it is a seedling of that variety. It is earlier by five or six days than the Hartford."

Mr. Beadle also couples together the two varieties. He says:—

"There is a variety of grape known by us as the Champion; it is known also by the name of the Tallman. At least I believe them to be the same grape, though that is disputed. It is a very early ripening grape; it ripens with us in August, and on that account it sells readily and is a profitable grape. When I spoke of five cents a pound I meant that was the retail price in our market. The grower does not get more than three or four cents. I presume that during the grape season you could go into our stores and get the Concord for five cents, but if you got a dozen pounds, you might get them for four cents per pound. Next to the Champion comes the Hartford Prolific, which is very profitable because it is early."

Mr. Dempsey does not speak very respectfully of either of these two varieties. He says:—

"The first grapes we get on the market are the Champion and the Hartford Prolific, and they really destroy the taste of the people. Most of them have been accustomed to growing wild grapes. These two varieties are not much in advance upon the wild grape. The Champion grape commands a good price and sells readily. There have been very few on the market. They usually bring about twelve and a-half cents."

The Iona is a choice variety mentioned by Mr. Haskins, of Hamilton, who says of it:—

"The Iona succeeds with us, but it is rather late. I can grow it in any quantity, but the season is too short to perfect it. On the Niagara River, or rather on Navy Island, it is ripened every year."

Mr. Hoskin, of Toronto, has a very high estimate of its quality. He says:—

“I have grown the Iona, which I think makes the finest wine produced on this continent. I have about eighty of the Iona vines. I grow it on my place because it is particularly favoured for its growth, being sheltered from the north. Except in favoured localities I would not recommend the cultivation of the Iona grape. It is a grape somewhat of the Delaware class, but about twice the size; it makes a very brisk and aromatic wine, and is altogether free from the fox. It is a hardy grape and healthy, but in ordinary places it does not ripen; it ripens with me, and I have made wine every year from it. It would ripen in the Niagara district I think. I would not advise its being cultivated north or east of this; it is as prolific as the Delaware. After having given it a trial I put in some forty or fifty more last spring. There is no wine like it on this continent. It was for this wine an extra prize was given me at the Exhibition. I exhibited six varieties of wine there, and they gave me the first six prizes, and I exhibited five in Toronto, and they gave me the first five prizes. The goodness of this wine was owing principally to the Iona and Delaware.”

The Creveling is mentioned by the same witness as one of the three varieties—the others being the Alvey and the Delaware—out of which he makes a choice sparkling red wine.

Mr. Haskins says of it:—

“The Creveling is one of our best grapes, but it does not set a good crop. Occasionally it sets a very fine bunch, but that is not always the case. In our vineyard we have two rows of Crevelings through the field, planted about twelve years ago, but I cannot say we ever got a good crop from them. They are in a very exposed place, but I have a few vines in the garden in a sheltered position, and they produce fairly. I believe it is a South Carolina grape.”

Mr. Beall, of Lindsay, as already quoted, finds the Creveling successful.

There remains now to be noticed only the three great prolific varieties—the Delaware, Concord, and Clinton. Of the Concord Mr. Haskins says:—

“Vineyards of Concord grapes, well cultivated, will produce five tons to the acre. I have never seen the vines of that variety so overloaded that the crop was too large to ripen, but this will happen with other varieties, like the Delaware. . . . Outside of Rogers' grapes the Concord is the grape for the million, because it will grow anywhere where the summer is long enough, and almost any soil will produce a good crop.”

Mr. Hagaman, of Oakville, who was called for the purpose more particularly of giving information respecting strawberry culture, proved to be an energetic grape grower. He said:—

“We find the Concord to pay the best. . . . I have almost invariably a good crop of Concorde. . . . We do not use the Concord as a wine grape. . . . I grew twelve tons of grapes on my acre and a half last year. They averaged me last year a little more than 4½ cents a pound. . . . The crop came to about sixty pounds to the vine. . . . I attribute my good crop to the nature of the soil, and good cultivation.”

Mr. Pettit, of Grimsby, also grows the Concord largely. He says in his evidence:—

"Of grapes, I cultivate the Concord, Diana, and Delaware. I find the Concord is the most profitable. I think almost any soil will grow good grapes if it is properly cultivated and drained. I am growing grapes on clay subsoil, with a mixture of sand and clay on the surface. I under-drained thoroughly before I commenced, and I have a splendid crop of grapes this year. My acre was planted two years ago last spring, being yearling vines when planted. This year I had over five hundred baskets, twenty pounds to a basket. I should say that twelve tons would be an enormous crop from one and a half acres, the vines being of seven years' growth."

Mr. Morris, of Fonthill, while preferring other varieties, and speaking highly of the Pocklington, still admits the Concord to be the one there is "most money in."

Mr. Toll, of Raleigh, Kent, cultivates the Concord chiefly, and for table use. About three tons per acre is with him the average production of the Concord, and the price obtained from 3 cents to 6 cents per pound. The Concord too, Mr. Toll says, escapes mildew which affects some other varieties. "Practically," he says, we have no difficulty in growing the Concord with ordinary care. Mr. Girardot, of Sandwich, who with his family represents quite an extensive grape growing interest in that district, and whose vineyard the Commissioners visited, says, "I have tried several sorts, but the most successful is the Concord. The Clinton and the Delaware, are also good grapes; but the Concord pays best." He goes on to say:—

"I can grow between four and five tons to the acre. Two years ago the crop was about 150 bushels to the acre; last year it was 130. From four tons of Concord grapes we can produce between 500 and 600 gallons of wine. I am manufacturing wine both for my own use and for commercial purposes. The value of this wine is about \$1 per gallon. The Concord grape bears evenly year by year, and for five years we have had no failure of the crop. I consider that grape culture in our part of Essex is a perfect success. I live in Sandwich."

He adds further:—

"The time when the Concord ripens depends a good deal on the season. Two years ago we had some ripe on the 7th of September, but last year it was on the 17th or 18th of that month. The later the Concord is pulled the better, but we have to pull ours a little earlier than we should, for fear of boys and birds. If they were left later they would require less sugar when manufactured into wine. The Clinton grape makes very good wine, but it does not bear so well as the Concord. Not only does the Concord bear better but the berries are larger and have more juice. The Clinton does not ripen evenly on my place, and there are always green berries upon the vines even when they are kept late. These berries spoil the wine. There are never any green berries on the Concord vines. The Clinton is susceptible to a disease under the leaves—a sort of leaf-gall which prevents the grapes from ripening well."

In addition to his allusion to the Concord already quoted, Mr Beadle says:—"Concord grapes at four cents a pound will yield more money per acre than most other varieties."

Mr. Dempsey says :—

“We grow the Concord to a considerable extent. The Delaware brings about double the price of the Concord. If I were planting a vineyard I would limit myself to these two varieties. I have planted a good many of Rogers’ red varieties on account of the high prices they command; red and white grapes have commanded about double the price.”

Mr. Arnold “thinks the Concord is perhaps the most profitable for market, because the public have little taste, and it looks well.” Mr. Beall, as already noticed, finds it one of the earliest to ripen at Lindsay.

Mr. Bucke, of Ottawa, makes it the standard for his district. He says :—

“Any variety that will ripen before, or at the time of the Concord, will succeed with us; anything later will not do.”

Mr. Allan, of Goderich, gives it as being with the Delaware, the most profitable for market purposes.

But, in addition to the rather equivocal support of one or two of its friends already quoted, it is repudiated altogether by Mr. Hoskin, of Toronto. He says :—

“I know the Clinton and Concord are grown extensively for wine making in Canada, and that has given the wine of Canada a very bad name. . . I had some of the Concord and Clinton vines planted, but I plucked them up. . . I don’t use the Concord at all. I condemn it for wine making. Of course you can make wine from it, but you will never touch Concord wine as long as you have Delaware in the house. For quantity the Concord is to be preferred, but it does not, with me, ripen so early as the Delaware; that is another thing to be borne in mind in the cultivation of grapes. Your grapes ought to be gathered by the 1st of October, for after that you are never safe from frost. The Concord is, if anything, a little better for a little frost. The frost does it no harm. Slight frost will not hurt the Delawares that are ripe at the time, but if they are not ripe and are attacked by the frost they fall off.”

There is not much difficulty in putting the Concord in its proper place, notwithstanding Mr. Hoskin’s very low estimate of its value. The Concord is admitted by all to be a hardy grape, and, with the advantage of not only bearing an early autumn frost without injury but actually bettering by it, it is extremely productive. It yields a large quantity of juice, and, consequently, as a grape for making wine on a large scale and of ordinary quality is cultivated, while, as a market grape, it always sells well. Mr. Arnold, as a connoisseur with the choicest grapes at command, thinks little of the popular taste for the Concord, and Mr. Hoskin, revelling in the manufacture of wines of the highest class, and commanding top prices, can afford to use the choicest of wine grapes.

In connection with the Concord, the Clinton and Delaware have both been more than once noticed. Mr. Haskins says of the Delaware :—

“The Delaware is a grape that I would not be without. It resembles the European varieties, perhaps, more closely than any other grape we have. We sell five or six tons of Delawares every year for table fruit, and it commands the market well. We sell them in Hamilton, and in this city (London).”

“Mr. Hoskin says :—

“After reading all I could on the subject, and making personal inspections of some of the vineyards of Canada, I came to the conclusion that the best grape for wine making was the Delaware. This grape in the first place is very free from what is called the ‘fox.’ All that are interested in the cultivation of grapes know what that means. What we mean by the ‘foxy’ grape is a mousey flavour, such as may be tasted in the Concord and Clinton; for instance, the taste is similar to the smell of a cup in which a mouse has been. The Delaware is also very free from disease.”

Mr. Beadle says :—

“Occasionally we see some mildew upon the Delaware, but not often. For amateur growth I would like the Delaware.”

Mr. Dempsey says of the Delaware :—

“We grow some varieties of grapes very successfully. The variety that succeeds best is the Delaware, and it appears to be one of the most profitable for market and for home consumption. We grow the Concord to a considerable extent. The Delaware brings about double the price of the Concord. If I were planting a vineyard I would limit myself to these two varieties.”

Of the Clinton Mr. Haskins says :—

“The Clinton grows very freely, and is very prolific; the most so of any wine grape we have, and that is all we use it for. Last year we had about twenty-eight tons of Clinton grapes and they ripened perfectly, better than for some years before. There is a peculiarity about wine made from Clinton grapes. It makes excellent wine, but it requires a few years to mature it; while other grapes make a wine that will be ready for use in a year. It holds so much acid in solution that it requires a longer time to precipitate it. The Clinton gives 200 gallons to the ton.”

Mr. Toll had no demand for the Clinton grapes and dug up his vines of that variety.

From the evidence it would appear that the Clinton is chiefly esteemed as a wine grape, especially adapted for the preparation of light acid wines. Some, however, who like tart fruits prefer the Clinton to some of the sweeter grapes, after its acidity has been mellowed by a frost.

THE MANUFACTURE OF WINE.

Wine making is so extremely simple a process there is no very great room for disagreement as to the method. Probably Mr. Haskins is the largest wine maker at the present time in Canada. His process is as follows :—

“After the grapes are gathered they are generally put through the mill so as to puncture the skins a little without crushing the seeds. If we are making one class of wine alone, after we have put the grapes through the mill, we put the whole mass, including the skins, into an open tank. We have tanks which hold about two tons each made of oak staves. The mill is set over the tank, and the

grapes are put through until the tank is nearly, but not quite, full—say, within seven or eight inches of the top. A lid is then put on the tank, and the mass is left there for a few days, care being taken not to allow the grapes to mould. In case we ferment the grapes with the skin we get a red or dark wine, that is, if we use a dark coloured grape. The Concord grape makes a very good light wine. The grapes are put immediately into the press, and the first run is put away as the best wine. After having pressed the remainder, and added sufficient sugar to give it proper strength and keep it, the second quality of wine is made. In making the second grade, water is put in to dissolve the pulp. The first run, if put away in barrels, will make good wine without the addition of anything, if the grapes have been well ripened. Before the second treatment we allow perhaps about a week to elapse, but the tanks must be closely watched for fear of moulding. I understand that in France there is even a third pressing, which makes the *Vin Ordinaire*. You must have 10 per cent. of saccharine matter in order to have enough natural spirit. All the light wines contain 12 per cent. or more of spirit.

“When the wine is in the barrels, you must leave the bung loose while fermentation is going on. The sediment should be taken out about Christmas. We generally rack it off with a siphon, the tube being put down within four inches of the bottom. The Clinton wine requires longer to mature than the others, and should have at least three or four years. The difficulty with some who make wine in this country is that they think it should be fit to use in three months. It should be kept until it is quite bright, and the fermentation has altogether ceased. If you look into a vessel which had contained Clinton wine, you would find crude tartar deposited in the form of crystals, in large quantities. The subsequent treatment is only a question of racking off, and keeping the vessel bunged, etc. If you draw off half a vessel, and leave the other half, you will find that the wine will be injured if a very light wine. I think the Concord grape wines and the Diana will mature earlier than the Clinton.

“There is no radical objection to the addition of a certain portion of sugar for the purposes of sweetening and maturing the wine. Sweet grapes should mature if properly ripened, but producers are apt to put in all together, and then the mixture is fortified with the addition of sugar. There is no reason why we should not raise grapes here with a sufficient quantity of saccharine matter to make wine as good as the imported. I am satisfied that we will yet be able to raise wine that will rival the best imported article.”

Mr. Girardot supplies one or two additional hints on the subject of wine-making:—

“In making wine I generally use a cider mill, though I could use anything else that would answer the purpose. We throw the grapes into the mill and grind them, and we then throw the juice—skins and all—into a tub holding one thousand gallons. If we want to get a white wine we draw it off before it begins to ferment. The remainder we leave to ferment from eight to ten days, and that makes the red wine. We can generally guess how much sugar to put in. We use only the purest white sugar, as the brown imparts an offensive taste to the wine. The grapes themselves will give enough ‘bouquet’ to the wine without adding anything else. We should be careful to use only clean barrels. We leave it in the vat eight or ten days, stirring it every day except the last two, so as to give the juice a chance to go to the bottom. It is then put into casks, the bung just being put in lightly so that the fermentation may go on. Some put a bag of sand on the bung-hole. The wine is left in the casks until we think the fermentation is over, and then we tighten the bung a little. The balance of the juice we press a little,

but we do not mix the second lot with the first, as it makes a poor quality of wine."

Mr. Hoskin, who, as has been noticed, makes only the choicest wine, gives the following as his method:—

"My process of making wine is very simple. I have no machinery, and use no press at all. The grapes are put into vats and covered, and the man just presses them, squeezes them with his hands, and rubs them round with a stick, but so as not to bruise the stones. He uses the slightest possible action so as to get what is really good juice, and from this process the juice will flow away if the grapes are ripe. The grapes are allowed to remain five or six days in the vats, fermenting; I don't do anything with them during that time. When the must begins to fall a little I draw it off into casks; I throw out the residue into the manure heap. The fermentation goes on probably for a month in the cask, which is bunged up. I don't use anything for refining the wine; it comes out as clear as crystal; it is wine after it is run out into the casks. I only make one description of wine, and do not make any from a second pressing. I never put spirits into the wine, because in the first place it destroys what you may term the brisk quality, and secondly if you have spirits or alcohol in wine the first thing you taste is the alcohol and not the wine.

"I find that the spirit generated by fermentation is sufficient to keep the wine. I have had the wine analyzed, and have found it to contain thirteen per cent. of spirit. My wine compared with the ordinary light wines is stronger. I don't make a business of selling the wine of course, but I have realized \$7 a dozen bottles, champagne quarts. I don't know how many gallons would be in the dozen bottles. That price would be a profit, and I could sell it all in England at the same prices.

"It has been alleged that Canadian wine does not keep in being taken over the Atlantic. That this is not so I established satisfactorily this summer, when I took some of the wine to England. When I had got there it was in a perfect state of preservation, and I observed no change whatever in it."

The question whether Canadian wine could find its way into the foreign market was pretty fully discussed. That it would stand the voyage had been fully and satisfactorily tested in Mr. Hoskin's evidence.

Mr. Haskins says on the subject of a foreign trade:—

"In view of the fact that a large number of vines in France and other European countries are being destroyed by the Phylloxera, I think our prospects are good. I never had any view of shipping the wine to England. I remember showing one wine to a gentleman from Birmingham, and when he tasted it, he said he would take all we had of that kind, but I happened only to have a little. It is a sort of wine which we are endeavouring to produce from our own seedling grapes, and I am satisfied that if we can produce it in quantity we will find a ready market in England for all that we can make. I see nothing to prevent Ontario from becoming a wine-producing and wine-exporting country. . . I think the duty on wine in England is half a crown (60 cents) per gallon. I am satisfied that I could sell wine of the kind I mentioned to almost any extent in England. It is what might be called a light port. I do not know whether we should sell it as port or give it a new name. If we were introducing our wines into England I think it would be better to name them after some portion of our country—Niagara, for instance. I would not call it port, else I should not be able to sell it in England."

Mr. Girardot says with regard to his experience:—

“I was born in France, but I don't think there is any part of France where grapes bear so much or do so well as in Essex. I was acquainted with the culture of the vine in France before coming here. In that part of France I came from, vines were cultivated upon small poles, 3 or 4 feet high; here we cultivate on trellises. I prefer the wine made from the Concord grape to that which is made in France. I think the clarets and other light wines which we import from France are inferior to our Concord wines. The latter would be a medium wine between No. 1 and No. 2. In 1878 I took out with me to France samples of native wine manufactured in Sandwich, and connoisseurs there declared it superior to the Vin Ordinaire, which is sold in that country under the name of Bordeaux. Without the duty we could import Vin Ordinaire at a cost of from 50 to 60 cents a gallon, but that wine would not be equal to ours. I think to import an article equal to ours would cost as much as ours does at present. Ordinarily it would cost from 50 to 60 cents per gallon in France. We can supply a good, sound wine here, equal to the French, at a much less cost than we could import the French wines and pay the duty. I do not think that the wines imported from France are, as a rule, anything like so wholesome as ours, because the foreign wine is generally doctored a good deal.”

Cost of Planting and Cultivating a Vineyard.

Mr. Hagaman, of Oakville, gives the following as the cost of planting a vineyard an acre in extent:—

300 posts, at ten cents each.....	\$ 30 00
Digging holes for posts.....	5 00
Wires for posts.....	15 00
Working the land first year.....	20 00
Putting in posts.....	4 00
Putting up wires.....	3 00
Staples to hold wires.....	2 50
300 vines (Concord), at \$8 per 100.....	24 00
Thirty loads of manure \$30, or, if the ground be thin, well rotted manure	45 00
	————— \$148 50

Of the foregoing some \$83 is chargeable to capital outlay. But it will take two years before the vineyard begins to bear, and then, only in small though gradually increasing quantities. In three years the grower may have a paying crop. So to the \$83 must consequently be added, not only the \$45 for manure, but also three years' rental, say, \$10 per annum, or \$30, and three years' care and cultivation, say \$60, making altogether, an outlay of about \$218, not allowing for any casualties in the meantime, or interest on capital. Once established, however, a moderate amount of manure and cultivation is all the land will need, the pruning and tying up the vines, and picking the fruit, being of small account, compared to the results of a paying crop.

Mr. Haskins thus describes his method of working his vineyard of some thirteen acres:—

"I put about four men on in the spring to prune about thirteen acres, and they get through in two or three weeks. Then comes the tying up of the vines, which is done by women. We cultivate with a gang plough, and the soil which was ploughed up to the vines in the fall is hoed out when the first weeds begin to come. When the vines grow out, we find there are many struggling shoots, and the women go through them and tie those up which we want to save, and any long vines growing over are cut off. We just keep back the tops. We never thin them out. In picking time we employ about twenty-five hands—two men and a number of women with baskets—that is, when we are picking for wine. Picking market fruit is done by two or three careful hands, who go through and select the best. For wine, the vines are picked clean, and the fruit moved to the cellar every night, and put through the mill the same night.

Planting the Vineyard.

"The first requisite in planting vines, unless the land has a gravelly sub-soil, and is naturally drained, is thorough tile drainage. Good, deep ploughing is the next thing, and it would be all the better with sub-soil ploughing, although that is not absolutely necessary. I think that is all the preparation required if the ground is in proper condition. For planting I would select vines two years old as being better than those that are either older or younger. No matter how large the vine is when planted, it is set back for a year, and I don't think anything is gained by purchasing vines older than two years. If the ground is in proper condition, and kept cultivated and free from weeds, and wire trellises are used, there is very little difficulty in growing grapes. Cuttings with two eyes, put in sandy soil, and properly shaded and watered will usually grow. I would shade them till September. I first take a frame like an old hot-bed frame, then a few light lath frames, covered with cotton, which can easily be lifted off when you want to water the plants. They require a thorough watering twice a-week. Very few propagate young vines for themselves, but I have rooted thousands of them. On Navy Island they are grown in a cultivated swamp, covered or mulched with swamp grass, and they succeed well. Of course they don't require watering there, as the ground is moist all the time. I think growing them in a swamp is as good a way as any, but they must be raised in the fall, and transplanted in the upland. If left in the swamp in the winter the roots would perish. Vines treated in the way I have spoken of, planted the second year in rows on dry land, would be ready to plant in the vineyard, if well taken care of. Those in the frames need not be transplanted. In the vineyard I would plant the vines ten feet between the rows, and eight feet between the vines in the rows."

Mr. Haskins adopts the following mode of training:—

"I prefer growing vines on trellises. We use cedar posts with four wires. The vines are generally planted running north and south, and I find that if the wires are fixed on the east side of the posts the prevailing winds from the west are sure to blow them down. It is therefore better to fix the wires on the side from which the prevailing winds come. To overcome the difficulty of the wires contracting in the winter, the ends of the wires are carried through the posts, notches are cut upon the outer surface of the posts at the points where the wires pass through, and pieces of oak lumber, one foot long and two inches square, are used as rollers, to which the wires are respectively attached. When they are not tight enough the oak rollers are turned and dropped into the notches on the posts, and thus the wires are held tight."

His system of pruning is as follows:—

“When the wood is old we use the spur system of pruning, but where it is new we use the renewal system. We let two or three ‘canes’ grow up from the vines every year and retain them, and the old ones as well. On pruning, if there is a surplus of the young wood we cut out the old wood unless it is very vigorous and promising; but on the renewal system they should be renewed whenever there is young wood to renew with. I prefer healthy young wood to the old. It is seldom you have new wood enough for the renewal system, so we follow both systems. All the surplus wood should be cut out. I cut back to one eye, though some leave two. I would not calculate on having much fruit at the angle where the new wood joins the old. In advising a person with regard to growing grapes I would not insist on cutting back to one eye, but would say, cut off either to one or two eyes. If the grapes are in a garden the best time to prune is in November, and if in the vineyard I would prune in March, leaving them on the trellises through the winter. I would prune from the middle to the end of March. I have never had any difficulty from the bleeding of the vines pruned at that time of the year. The result of pruning in April would probably be that there would be more running of the sap than in March, and the flow would be so excessive that the vine might be injured. We never leave pruning so late that there is any such risk as that.”

As to the aspect of the vineyard, and the manure best adapted for vines, he says:—

“For grapes I think any well-rotted manure is good—stable manure which is rotted thoroughly. Manure from old hot-beds is also very useful, as are ashes, either leached or unleached. We once used on our vineyard four or five tons of bone dust, but it is too expensive, though we had a very good growth from it. We have not repeated the experiment since. For a vineyard, I prefer a south-eastern aspect, with the rows running north and south. If you start the vines at two years old they will take root the first year, grow one cane in the second year, and in the third year you will have a little fruit with a good deal of wood, and in the fourth year you should have a full crop.”

For the mildew on the grape, the application of sulphur in powder in very small quantities, is a curative.

Written, as this report is, for and in the interest of the agriculturist, it is needless to describe at all minutely the Catawba variety of grape, although producing a wine of rare and well recognized merit. The Catawba is occasionally planted in the Niagara district, and at favourable points on the south-western coast line. In some few spots it may ripen pretty regularly, not missing more than once in six or seven years, but in the Pelee Islands alone is its cultivation so sure as to be carried on for the manufacture of wine on a large and marketable scale. At that place, however, the industry is a large and, no doubt, highly profitable one.

The alleged but disputed presence, in this country, of the *Phylloxera* and the nature of other insect enemies of the vine, will be duly noticed hereafter.

To the farmer whose land is not worth more than \$3 to \$4 per acre, who can make his posts out of timber off his own farm, and obtain the services of his whole family in connection with the management of the vines and the harvesting of his crop of grapes, the appropriation of an acre or two to grape cultivation can

hardly fail to be profitable, while at the same time an object of no little pleasant interest to those around him.

It may be mentioned here that as a guide to vine management, Mr. Haskins strongly recommends a book by Fuller, of New York. There is also one, but not quite so well adapted to this country, by Hussman, of Missouri.

CHAPTER IV.

FORESTRY AND ARBORICULTURE.

In dealing with the large and very attractive subject of fruit-growing, the Commissioners have had occasion to use only the language of encouragement, but, in connection with the topic they have now to discuss, they have to utter words of warning, perhaps even to give expression to some alarm, for, from the day that the first pioneer settler entered Upper Canada until now, a process destructive to our forest wealth has been rashly, recklessly, wastefully, and it may even be said wantonly, going on.

No one seems to have stopped to inquire into the relations which, particularly in such a climate, the trees of the forest bore to the operations of the husbandman, affected the rain and snow fall, protected the crops, or served any other purpose than to supply fence rails or cordwood.

If the farmer who entered the country fifty or sixty years ago were told he might have secured for himself at this moment, in timber alone, an amount equal to the value of his farm at the highest given price, and that he could have obtained this without sensibly diminishing the area under cultivation, he might be incredulous. But there are, nevertheless, many districts where such an assertion would hold good, where a fortune which might have been saved has been split up into snake fences or sent whirling in clouds through the stove pipe.

Meantime, while men have toiled early and late to shelter themselves and their families—and let us hope their cattle too—in comfortable buildings, and to provide the necessaries of life, they have deprived the “staff of life” of its natural and necessary shelter, and seen, time and again, perish before their very eyes, the wheat and clover on which have depended much of their prosperity.

Small blame, it is true, attaches to the pioneer in a wooded country if he does cut and slash at all obstructions somewhat ruthlessly. The early settlers in Upper Canada often found themselves in circumstances almost desperate. They had neither roads, nor markets for timber if they preserved it, and, surrounded by what seemed to them an illimitable extent of forest, they naturally took small account of what might be the state of things in the days of their grandchildren or their great-grandchildren. But it is surprising to see that, even with the bare facts staring them in the face, our farmers who are practically to-day the owners of the remaining timbered lands of the Province in all the

settled districts, are in a condition of profound lethargy or innocent unconsciousness of the dangers they invite or the losses they incur.

Still there is time even yet on many farms in not a few of the counties, for waste to be prevented, danger averted, and money saved, if men will only shake off the apathy they have hitherto exhibited, and see the true state of affairs in the light of self-interest, not to say self-preservation.

How little idea of providing against the continued depletion of the forests many of them have, was well illustrated by an incident that occurred during one of the early sittings of the Commissioners. The witness before the Commissioners was a gentleman enjoying beyond most the confidence of his brother agriculturists—an admirable specimen of an intelligent and substantial yeoman. To the question, whether anything had been done in his district in the direction of replanting forest trees, he replied in an almost surprised manner:—

“We do not think that we have reached the miserable condition which requires us to face that difficulty yet. We have more bush than there is in many parts of the West.”

But it happened that, just before, this same gentleman had told the Commissioners, that his crop of fall wheat had been saved from winter killing—by what—*by the accidental shelter afforded it, not by his own, but by his neighbour's bush.* But for this—the merest chance—one of the best farmers in Ontario would not in all probability have had enough fall wheat to pay for the harvesting. And yet he almost scornfully repudiated the idea of planting a tree.

Nor is this all. Not only have the farmers of Ontario destroyed property of fabulous value, in the clearing process; not only have they denuded their lands of necessary protection; not only have they dried up their streams, and left dry ditches in many places to mark where once existed a valuable water-power; but they have been, and still are, going on very fast with the destruction of their supply of fuel. Instances have come *within* the observation of the Commissioners, where men who took up bush land *thirty* years ago have so thriftlessly managed their timber, that to-day they have used the last stick and are actually buying cordwood.

But there is hope yet. Ontario is not the only country that has had to face the situation in this respect, and is to-day, thanks to her prodigious forest wealth, better off than many. If some choice woods are nearly exhausted, many others of high marketable value still remain. There are, in the settled counties of Ontario, and altogether exclusive of free grant territory, containing every variety of timber used for economical purposes, forests as extensive in area as some not unimportant European principalities. The woods of Ontario consist principally of the elm, oak, ash, hickory, butternut, maple, beech, chestnut, poplar, birch, cherry, basswood, hemlock, cedar, tamarack, cotton wood, ironwood, whitewood or tulip tree, willow—where it has not been wholly destroyed, the walnut; and in addition to this the pines, balsams, and spruces, in great variety. And all these

have now a recognized place in the markets of the world. It is not the duty or purpose of the Commissioners to discuss the relations of the Government to the lumberman, or of the latter to the settler. They look at this question solely as it affects the interests of the agriculturist, and through him the country, and while, as may be pointed out, the cultivation of the pine and other coniferous trees is to be encouraged on various grounds, it is with the deciduous (generally known as hardwood) trees they are most largely concerned, so far as relates to the question of timber supply or cultivation.

It is proposed, therefore, now to notice:—

1. The management on cleared farms of the bush, usually from five to twenty acres in extent.
2. The economic uses of the several varieties of timber.
3. The market value of various woods.
4. The age of trees maturing, and conditions in which they are merchantable.
5. Tree planting, including choice of trees, methods, and cost.
6. The construction of wind-breaks or shelter belts in fields and orchards.
7. The planting of trees and shrubs for ornamental purposes.

Preservation of Standing Timber on Farms.

The usual treatment of the standing timber on a farm, unless cleared to be used as a grove, or where it consists wholly of sugar maples, is unscientific and wasteful to the last degree. Its final disappearance is looked upon as inevitable, and the process of chopping and clearing mows it down as surely and steadily if not quite so rapidly as a reaper the field of grain. Now, in most cases, by selection and good judgment, the bush may be saved, and enough timber for all useful purposes still obtained. In a very interesting and comprehensive letter to the Commissioners, the Hon. George W. Allan, of Toronto, alludes to this particular matter.

He says:—

“And here let me remark in passing, that, in this country, where tree growth is so rapid, if every farmer who has not been so recklessly improvident as to leave himself without a few acres of bush on his farm, would only manage his bit of woodland, be it twenty, fifteen, or even ten acres only, carefully and systematically, it would keep him, and his children after him, supplied with fuel, and to a great extent with timber for fencing and repairs on the farm.

“I have known instances of pieces of woodland of from twenty to twenty-five acres in extent, which have been thus systematically cut now for twenty years and upwards; no tree under a certain diameter was allowed to be touched; all the young growth of beech, oak, maple, elm, etc., was carefully protected; and the result has been, that these comparatively small reserves have continued to furnish, under the same management, sufficient firewood for the wants of their owners, as well as much useful material for repairing fences, gates, and out-buildings.

“On many farms in Ontario, however, not an acre of wood is now left, and on many more, the small reserves are rapidly dwindling away, so that planting

would seem to be the only means of providing—at least in country districts—a supply of firewood for the future, unless our farmers are to burn coal, and become dependent in a great measure for their fuel on a foreign country.”

By selecting (1) such trees as are in demand for mechanical purposes, and (2) those of an inferior class, for fuel; carefully cleaning up all mere rubbish, and encouraging the development of seedlings and second growth by judicious thinning, the timber crop will be literally perennial. Where too, it is necessary to clear, belts, or clumps of second growth, may be profitably left to form shelter belts in the first instance, and timber-yielding plantations in due course. In the course of his address to the Commissioners, Prof. Buckland mentioned a little incident within his experience, bearing on the last suggestion. He said:—

“The question of raising trees from second growth is a practical one, and I am aware of at least one instance in which the plan was successful. About thirty years ago I was staying a few days with a farmer in Prince Edward County, who was clearing up eight or ten acres of bush and burning it. Three or four acres were covered with second growth maple, and I persuaded him to leave that for the purposes of a sugar bush. He did so, and now it is one of the most beautiful little sugar bushes you can find in Ontario. This, of course, could only be done where the maple is the predominant wood.”

Coppices.

The subject of coppices, or the cultivation of young timber from the stumps of a former growth, is discussed in Dr. F. B. Hough's very able report of 1877 to the United States Bureau of Agriculture. Some of the information given by Dr. Hough under this head will be of practical interest in the present connection. Dr. Hough says:—

“The coppice is a growth of timber of various deciduous kinds, from the stumps of a former growth, and is usually cut before maturity, at intervals of from ten to forty years, according to circumstances and the uses to which the product is to be applied.

“This mode of cultivation is in great favour for the growth of firewood, and the smaller wood used in various industries, and is the means by which tanning materials are often produced from the oak, where reliance is necessarily had upon this means for supplies.

“The coppice of short period produces hop-poles, and the stakes and vine-props so much used in vine-growing countries, and in many parts of this country may be able to supply, with but little care beyond protection, the fencing material and other woods required for farm purposes. It is destined to be in future of great importance in the growing of poplars for paper-making.

“The trees that sprout best from the stock are the ashes, elms, oaks, poplars, cottonwoods, willows, chestnut, linden, mountain ash, maples, sycamore, birches, alders, and hazel. The beech will reproduce but slightly, except in very favourable conditions, and the conifers not at all, with the single exception of the California redwood.

“Whatever may be the effect upon the durability of the timber by cutting at particular seasons, we have, in case of coppice growth, no alternative choice, and must cut in winter, and, by preference, toward the approach of warm weather

but before the sap starts, as at this time alone will the stumps be in best condition for sending up a vigorous crop of young shoots. The months of February, March, and first part of April are generally best for this labour.

"In cutting, with the view of reproduction, the stumps should be left low, and the tops sloping and smooth, so as not to admit water. It is sometimes the practice to dress off the stump in a convex form with an adze, taking especial care not to separate the bark from the trunk. It is along this line of union, between the wood and the bark, that the young shoots start, and if separated they will not sprout. . . .

"In the cutting of coppice woods it is often the practice to leave a certain number of choice trees of the more valuable kinds to grow to full maturity, and thus acquire a much greater relative value than if cut small. These reserves may be kept through two or three periods or 'revolutions.' They influence the young growth by their cover and shade, and when properly distributed may be, on the whole, beneficial rather than injurious to the future crop. They should not cover more than a twentieth, or at most a sixteenth, part of the whole surface. As the same stocks will be weakened by repeated cutting, care should be taken to secure new roots from time to time, and one means of doing this is to bend down the tops of some of the sprouts and bury them partly in the soil, by which means new roots will in some species form, and when fairly established they may be separated from the stock. Such sprouts should be held down by hooked stakes, and the tops kept in position by a piece of sod."

It will be seen from the foregoing how important a source of wood supply, and of income too in many cases, the gradual and judicious removal of the larger trees, and the careful and intelligent cultivation of a second growth may become. If in clearing up land a strip or belt of timber were left on the north and west sides of every ten or twenty acre lot, and intelligently handled in the way suggested, not only would a very excellent wind-break be maintained, but the farm would yield two crops annually in place of one, with very little loss of space, and with, probably, a gain rather than a loss in the value of the grain crops.

Economic Uses of Woods.

While pine has, in everybody's mind, a certain recognized market value, other woods are often regarded, or at all events treated, as though they were all but worthless, or, if marketed, handled and disposed of with little practical intelligence. Since the sittings for taking oral evidence closed, the Commissioners—impressed with the importance of the subject—have put themselves in communication with Messrs. John Oliver & Co., of Toronto, a firm referred to by Mr. Hay in his evidence as large dealers in hardwood lumber. Messrs. Oliver & Co. have been good enough to supply the Commissioners with a considerable amount of additional information, and their statement will be referred to in the Report.

The value of timber in an economical sense, must of course depend on the purposes to which its several varieties can be profitably adapted. The principal uses, in general terms, of Canadian forest woods, exclusive of pine, are as follows:—

THE ELM.—"Rock Elm," says Mr. Hay, "we don't use except for building purposes. Soft elm makes a better seat for chairs than basswood." Carriage

making, heads of barrels, and hubs of waggons, and agricultural implements, are also mentioned as utilizing elm in considerable quantities. Other classes of elm are in limited demand, but chiefly used for the manufacture of common furniture.

THE ASH.—Of the white ash Mr. Hay says:—

“White ash is a very valuable wood, and makes excellent bedroom furniture. It may be used for house fittings. A good many offices are now fitted up with hardwood, and also railway carriages. Ash is used largely by carriage builders. There is no wood will stand like ash in that respect; it is next to mahogany. It is a shame to see our valuable wood cut down and wasted as it is and has been.”

The ash is now being used to a very considerable extent in the construction of the interiors of railway passenger cars. Bent stuff for tools, agricultural implements, hay-forks, hoe and broom handles are also manufactured from ash. The use of ash, for the internal fittings of buildings, alluded to by Mr. Hay, as practicable, has according to some other reports been pretty extensively adopted. Mr. Beadle, referring to his own experience, says:—

“When building my own house I found I could obtain chestnut and ash wood as cheap as, or cheaper than first-class pine, and I used them. I think they are much more handsome than painted wood work.”

Black Ash is more plentiful, but its uses are limited.

THE MAPLE.—Mr. Hay says of the use of maple in his business (furniture manufacturing): “You can get any quantity of the hard maple, but it is the soft maple that is the most valuable. It is the more valuable for furniture as it stands better and does not warp. Soft maple is not so plentiful as hard.”

In the United Counties, soft maple is sometimes used for house-flooring; it is also in some demand by agricultural implement manufacturers.

Mr. W. C. Caldwell, M.P.P., of Lanark Village, says:—“Hard maple is used for waggon axletrees as well as several other purposes. I had an order for some from Manitoba, but could not supply it in time.” Maple has also, according to one report, been used for paper pulp making.

THE OAK.—Oak is used for a variety of purposes, the manufacture of barrel staves being one of the largest causes of demand for this wood. It is also used to a considerable extent in agricultural implement manufactories, and for ship building. “Of oak” (say Messrs. Oliver & Co.) “there are considerable varieties—white, red, grey, and blue. The former is the most valuable. It is found in several parts of the Province, principally in the North and West. A large quantity of it is made into square timber for export.” Mr. Dempsey mentions in his evidence that the Grand Trunk Company got a good deal of white oak from his section (Prince Edward County), for the purpose of making railway cars. Ties are also made of oak, where the wood is sufficiently plentiful. Mr. Hay objects to oak because it is hard to work, and “warps like the mischief,” nevertheless it is not unfrequently used for furniture.

The firm of Bennett Bros., of London, manufacturers of church and school furniture, write as follows with regard to the use of oak :—

“It was stated that oak is unfit for furniture. If white oak was meant this was correct; but white oak is valuable for many other purposes, namely, staves, bent ware, and carriage work; but it is, and has been, so valuable, that it is nearly as scarce as walnut in this country, and will soon have to be imported in the same manner as walnut.

“There are, however, other varieties of oak, black or red, and yellow, of which there are large quantities in all parts of the country, both of which are well adapted for furniture, being straight in the grain and not liable to warp or change its shape, besides being easily wrought, and when finished, there is no wood to equal it in appearance except walnut, and perhaps some varieties of white ash.

“We might state that we use it entirely in church furniture and school work, and it is to be regretted that so much of what is destined to become a valuable wood is being destroyed through ignorance.

“As you are probably aware, fashions change in wood like in everything else. Twenty-five years ago it was all mahogany and oak, then walnut; at the present it is imitation of ebony, mahogany coming in, with a prospect of oak to follow, in which case oak will become a valuable wood.”

THE CHESTNUT.—Of this wood Messrs. Oliver & Co. say :—

“This wood is now almost extinct, and what remains is confined to the same limits in the Province as is walnut. Its principal use is in the finishing of churches, also public and private offices.”

THE POPLAR.—A considerable demand has sprung up for poplar, the wood of which is used for making paper pulp. In the Niagara district, and in Prince Edward County, as well as elsewhere, it has been eagerly secured at from \$3 to \$4 per cord for that purpose. The demand for poplar for this branch of industry is likely to increase rather than diminish. Poplar is also used to manufacture charcoal for smelting purposes.

THE BIRCH.—In view of the rapid disappearance of the walnut, the black birch will be the alternative with furniture-makers. Mr. Hay says with regard to this wood :—

“Black birch will be the only wood you can fall back on in a few years. In the north there is a great deal of it. It is an excellent wood. At present it is not dear because it is not scarce.

“You can get any quantity of it north, and it can be purchased at the mill readily at from \$15 to \$16 a thousand. Black birch is to be found in all the northern regions. There is a great deal in the Manitoulin Islands, and in the Peterborough and Haliburton district. It is to be found also in Muskoka. They have been shipping birch from Lower Canada these many years back. It is quite an article of export there. Black birch is mixed with the different woods of the country in large quantities. It is very easily detected among other trees. I don't use so very much of it now, but it is on birch we shall have to fall back after the walnut is gone. It is from birch that these perforated chair bottoms are made. I think there is such a thing as bird's-eye birch, but it is very scarce. I wouldn't give more for that kind of birch than plain wood.”

Messrs. Oliver & Co. say of the birch :—

“This wood is found in nearly every part of the Province. It is a very fine

wood, and although the demand for it is yet very small, there is little doubt but that, in a few years, it will be largely in request for the uses to which cherry, butternut and walnut are now put. It should be husbanded with the greatest care."

THE BEECH.—Beech has no standing in the market except for fire-wood.

THE BASSWOOD.—Basswood, like poplar, is in good demand for paper-making purposes. Mr. Caldwell, M.P.P., also refers to it as used for furniture, and for boxes in starch factories. All that can be got is shipped to Oswego. Mr. Hay uses it for furniture. It can be used in some cases in place of pine, and is cheaper than clear pine. Mr. Beall says:—

"Basswood, until lately, has been largely used for buggy making, but it is not so much used since the introduction of bent wood for the bodies of buggies."

THE WHITEWOOD OR TULIP TREE.—The whitewood or tulip, which grows exclusively in the warmer sections of the Province, is used largely by carriage-makers in constructing the bodies of carriages. Messrs. Oliver & Co. say, about the whitewood:—

"A few years ago there was a large quantity of this wood growing in the western part of the Province, but owing to the great demand for it, it is being rapidly consumed and is now very scarce. It meets a ready sale at good prices. Its principal uses are for car and carriage building, and in the manufacture of furniture."

THE WILD CHERRY.—A large demand for this wood has sprung up, chiefly in the United States. Mr. Hay says of it:—

"In supplying the place of walnut, cherry is a very valuable wood. They are using it very extensively in the United States, making ebonized furniture from it. It has a very close grain, and it is very fast disappearing. I am speaking of wild cherry. That tree grows to a fair size. We get some lumber twenty and twenty-two inches broad from it. I never saw a cherry tree growing, so that I can't say how much lumber there would be in one. I can't say whether they are high or not, but some of them grow to nearly the same girth as walnut."

"The wild cherry forms a resource to fall back upon in the absence of walnut, but it, too, is fast disappearing. We are exporting wild cherry largely to the United States, where black furniture is very fashionable, and cherry lumber takes the best stain. I think it as enduring as walnut."

Cherry wood is also being used largely in the internal fittings of cars and public buildings.

THE WALNUT.—The Black Walnut, so far as it exists, is the staple article in demand for cabinet work of all kinds. Mr. Hay thus refers to this wood:—

"When I first came to this country there was very little walnut used, but one or two years afterwards it came to be used more extensively. I think it was Sir Peregrine Maitland who first introduced walnut here, and who was the first to make it fashionable. Previous to that, they had used cherry, or any of the common woods. Since its first introduction, walnut has been the staple fashionable wood for making furniture."

"When we first commenced making walnut furniture we got the wood from Canada West. A great deal came from about Port Stanley and the banks of the

Thames, in Kent, Essex, and south Middlesex. We now obtain very little walnut indeed from that part of the country.

"Lately we have been getting our principal supplies of walnut from Indiana. The walnut grown in that State is as good as that grown in Canada, but as you go south of Indiana the walnut is of a lighter shade. The dark walnut grows best in a climate such as that of Michigan or Canada. I don't suppose the supply in Indiana is inexhaustible. I have been told, in fact it will not last a great many years.

"When I came to Canada first they used walnut for rail fences. . . . The principal value of walnut is that it is an excellent wood for furniture, and is handsome in appearance. It is universally admired, has a close grain, is not liable to be much affected by changes of temperature, and at the same time it is not hard to work. It is a very valuable timber economically.

"I couldn't say exactly what time it would take for a walnut tree to grow to maturity, fifty or sixty years at least. I don't know any other part of Canada where walnut is to be found except the district I have mentioned. There was a little one in the Niagara District, but that has been cut down. There is none at all north of us. I don't think any careful examination has ever been made of the walnut region to ascertain how much of the wood may still be remaining; but I am sure there can only be very little left. I have never appointed an agent for that purpose. Walnut is admitted free of duty into Canada; it would be a desirable thing to replant walnut. There would be a great market for it."

Black walnut is being used in the manufacture of sewing machines, organs, and ear building, as well as for the purposes already mentioned.

THE BUTTERNUT.—The Butternut is mentioned as being used in many cases as a substitute for walnut for cabinet work, since the latter has become scarce. Mr. Hay does not, however, utilize it to a large extent in his business. He says: "Besides cherry, butternut is a useful wood. Some call it white walnut. We do not get a great deal of butternut, as we cannot use it much for furniture. It is not a substitute for the black walnut. Some houses inside are fitted up with it." Butternut is excellent wood for veneering, and also used in finishing the interior of churches and other public buildings, and in the manufacture of cigar boxes.

THE HICKORY.—Hickory is in demand from very early stages of its existence, to the time of mature growth. Mr. Beadle says, in connection with this wood:—

"One of the greatest pests we have in our country is the axe-helve hunter. When a hickory tree gets to be six inches in diameter he will offer the farmer so much for it that he is induced to sell it."

For handles for tools, hickory is in perpetual request. The spokes and finer parts of carriages, are also made of hickory.

SYCAMORE.—Of the Syeamore, Messrs. Oliver & Co. say:—

"This wood is grown entirely in the western part of the Province, and being scarce is in good demand. It is not much used in Canada, and what there is, is principally manufactured into tobacco boxes. Owing to the high prices to be paid for it, soft elm and basswood are being used as substitutes."

THE CEDAR, HEMLOCK, TAMARACK.—There is a constant demand for these woods, or one or other of them, for rails, posts, railway ties, and many other purposes. Hemlock bark is also largely in request by tanners for tanning hides.

Commercial Value of Woods.

The following are furnished by Messrs. Oliver & Co., as the present prices for the different kinds of lumber on board cars on the different lines of railroad nearest to the mills. The prices given are, per thousand, board measure—

Walnut, best quality, according to thickness and lengths, \$60 to \$70	
“ common	50
“ culls.....	30
Cherry, best quality, clear of hearts, large knots and shakes...	22
Butternut, “ “ “ “ “ “	22
Whitewood, “ “ “ “ “ “	21
Chestnut, “ “ “ “ “ “	18
White Oak, “ “ “ “ “ “	17
White Ash, “ “ “ “ “ “	17
Hickory, “ “ “ “ “ “	16
Rock Elm, “ “ “ “ “ “	13
Sycamore, “ “ “ “ “ “	12
Balm of Gilead, “ “ “ “ “ “	12
Birch, “ “ “ “ “ “	11
Black Oak “ “ “ “ “ “	11
Grey Oak, “ “ “ “ “ “	11
Black Ash, “ “ “ “ “ “	11
Basswood, “ “ “ “ “ “	10
Maple, “ “ “ “ “ “	10
Beech, “ “ “ “ “ “	10
Soft Elm, “ “ “ “ “ “	9

CEDAR—HEMLOCK—TAMARACK.—For railway ties from these woods the railway companies pay as high as from \$20 to \$30 per 100.

Useful Hints.

The firm, whose list of prices has just been quoted, also give some excellent practical advice to farmers in this connection. They say :—

“ The kinds of hardwood lumber most in demand, either in the Dominion or for export, are walnut, cherry, butternut, chestnut, white ash, white oak, whitewood and basswood, all of which are now in good demand, as manufacturers are increasing their works and new ones are springing up in every part of the country. In the course of a few years these woods will become very scarce, and some of them will become entirely absorbed. This will cause the more common kinds, such as maple, birch, soft elm and black ash, to take their places.

“ Our farmers, who own timber lands, cannot be too careful of them, and should use them with a sparing hand, for in the course of a few years their value will be largely increased.

“ Our export trade is confined to the States and Great Britain, the former taking our sawn lumber and the latter being supplied in the shape of square timber.”

Careless Sawing and Piling.

A great loss is sustained by want of care or skill on the part of the small local millowners, in the manipulation and piling of hardwood lumber. Messrs. Oliver & Co. say, on this point:—

“One of the greatest drawbacks to the hardwood timber business is the difficulty experienced in getting the lumber properly manufactured. While there are many mills distributed throughout the Province, very few of the sawmill men seem to know, or if they do don't care, how they cut their lumber. In most cases they will cut the logs through and through, thus leaving the heart in the lumber and often one or more inches of bark on one side, besides making the boards of uneven thickness. When they measure such lumber they do so on the wide side, and make no allowance for heart lumber. This is the source of great trouble to the purchasers, as when properly measured there is a great difference, even in a few thousand feet. All hardwood lumber should be cut free from hearts and shakes, and, when cutting, the logs should be turned so as to make the lumber as clear as possible, as a piece of good lumber, either inch or thicker, six or eight inches wide, is worth far more than one twice the width with a heart or shake in the centre or on one edge; further, it should all be cut uniform in thickness and parallel width, and also square edged. Then, again, a great loss is occasioned by improper piling of the lumber, as often good lumber is completely spoiled and rendered worthless from the way in which it is piled. The piles should be started on firm foundations laid north and south, as lumber piled in these directions prevents the hot summer sun from splitting the ends. Each length and thickness should be piled separately, and, except in long lengths, should only have two cross pieces; in lumber twelve to fourteen feet long, these should be about nine feet apart. The pile should have a slope of about six inches. This can be done by placing the back stringer six inches lower than the front. This fall causes the rain to run off. The front piling strip should be put across at the very end, or even a little past the end, and each board or plank should come a little forward of the one below it. The piling strips should be over each other, or rather a little in front. For instance, a pile twenty feet high should overhang say two feet, and a straight-edge put up on the front of the pile should touch all the front cross pieces, and not touch the ends of the lumber. The lumber should not be allowed to remain uncovered, but should, as soon as piled, be covered with culls or cheap lumber. The ends of the covering-boards should extend over the front and rear, and be tied down or have heavy pieces of timber thrown on the top to keep the wind from blowing them away. The piles should be finished as quickly as possible.

“If sawmill men would only attend to the above instructions they would get from one to three dollars per thousand feet more for their lumber.”

Tree Planting—Ages and Dimensions of Trees.

Hitherto, the observations made have applied more particularly to the case of persons owning timbered lands of lesser or greater extent, and to whom the economical handling and management of their bush is of very great importance. The subject of tree planting will next receive some attention. It is probable that not a few farmers neglect the work of planting forest trees from the notion that their growth will be so tardy as to make the outlay of time and a little money worth-

less to them in their day and generation. The idea of handing down a fine estate to their sons is not so constantly present to the minds of Canadian farmers as to those of men in older countries, and a craving to achieve—even at some loss—immediate returns, is one of the weaknesses of the times. But it is possible to show not only that very speedy benefits of a practical nature may be conferred by tree planting on the soil itself, but also that, in actual money receipts, the investment will in a few years be a paying one. Horace Greeley has some very excellent advice to give under this head, and it may not be out of place to quote his utterances here. Greeley was, it will be seen, an advocate for the gradual substitution of new woodland plantations for the old forests—a very wise policy in most cases when carefully carried out. His first remarks are in that direction. He says:—

“I have said that I believe in cutting trees as well as in planting them. I have not said, and do not mean to say, that I believe in cutting everything clean as you go. That was once proper. . . . It is still advisable in forest-covered regions, where the sun must be let in before crops can be grown; but in nine cases out of ten timber should be thinned or culled out rather than cut off; and for every tree taken away at least two should be planted or set out. . . .

“Why do not farmers infer readily, and generally, that growing indifferent timber, where the best and most valued would grow as rapidly, is a stupid and costly blunder? It seems to me that whoever has attained the conviction that apple trees should be grafted, ought to know that it is wasteful to grow red oak, beech, white maple, and alder, where white oak, hickory, locust, and white pine might be grown with equal facility, in equal luxuriance, provided the right seeds were planted, and a little pains taken to keep down for a year or two the shoots spontaneously sent up by the wrong ones.

“North of the Potomac and east of the Ohio, and, I presume in limited districts elsewhere, rocky, sterile woodlands, costing \$2 to \$50 per acre according to location, etc., are to day the cheapest property to be bought in the United States even though nothing were done with them, but keep out fire and cattle, and, let the young trees grow, as they will. Money can be more profitably and safely invested in lands covered by young timber, than in anything else. The parent who would invest a few thousands for the benefit of his children, or grandchildren, still young, may buy woodlands which will be worth twenty times their present cost within the next twenty years. But better even than this would it be to buy up rocky, craggy, naked hillsides and eminences, which have been pastured to death, and shutting out cattle inflexibly, scratch these over with plough, mattock, hoe, or pick, as circumstances shall dictate; plant them thickly with chestnut, walnut, hickory, white oak, and the seeds of locust and white pine.”

He then meets the difficulty above suggested. He says:—

“Many farmers are averse to planting timber, because they think nothing can be realized therefrom, for the next twenty or thirty years, which is as long as they expect to live. But this is a grave miscalculation. Let us suppose a rocky, hilly, pasture lot of ten or twenty acres, rudely scratched over as I have suggested, and thickly seeded with hickory nuts and white oak acorns only; within five years it will yield abundantly of hoop-poles, though the better, more promising half be left to nature, as they should be; two years later, another and larger crop of hoop-poles may be cut, still sparing the best; and, henceforth, a valuable crop of timber may be taken from that land; for, if cut at a proper season, at least, two thrifty

sprouts will start from every stump; and, so that wood will yield a clear income each year, while its best trees are steadily growing and maturing. I do not advise restriction to those two species of timber; but I insist that a young plantation of forest trees may and should yield a clear income in every year after its fourth."

In the Report of Dr. Hough, already referred to, and from which the quotation from Mr. Greeley is made, is a statement bearing upon the same subject made by Mr. O. B. Galusha, in the course of a lecture delivered at the Industrial University of Illinois, in 1869. Mr. Galusha says:—

"Let us estimate the expense of raising a growth of ten acres planted with white ash and black walnut, five acres of each. These varieties grow at about the same rate, and are about equally valuable for lumber. . . .

"A good way is to plant in rows eleven feet apart, running north and south, and three feet eight inches (in the marks for corn). This will secure straight trees, being closer, and they may be thinned out to eleven feet each way when large enough to use for grape-stakes, bean or hop poles. This will give 300 trees per acre, or 3,000 trees in all, allowing for some vacancies, though in all cases of tree planting, whether in groves or screens, a supply of good plants grown elsewhere should always be in readiness to use in filling vacancies, which should be done at the end of the first year.

"The preparation of the ten acres at \$5 per acre would be \$50. Average cost of seed, 50 cents per acre, \$5. Planting, \$25. The cultivation during the first five years will be paid for in the crops grown between rows. For cultivation from fifth to ninth years (four years), with horses only, \$30 per year, \$120. After this time no cultivation or care will be needed. This makes the entire cost, in seed and labour, of the ten acres of trees, \$200. These trees will at twenty-five years of age, average sixteen inches in diameter at the ground, and about ten inches at the height of sixteen feet. This will give, deducting waste in sawing, 120 feet of lumber per tree. Allowing one-sixth for damage by the elements and loss from other causes, we have in round numbers, 360,000 feet of lumber, which, at \$50 per thousand would amount to \$18,000. The value of the tree tops for fuel would be equal to the cost of preparing the logs for the mill, and the expense in sawing would not exceed \$5 per thousand. This, added to the cost of producing the trees, and the amount deducted from the value of the lumber, leaves \$16,000 for the use of ten acres of land for twenty-five years, and the interest upon the amount expended in planting and cultivating the trees. This statement may be deemed incredible perhaps, by those who have not previously turned their attention to the subject; but after much study and many years' observation and measurements of growths of different varieties of trees, I am convinced that in all well-conducted experiments in growing artificial groves upon our large prairies, the profits will not fall far, if at all, short of the rates above stated."

As the owner of a large farm and other landed property, Senator Allan has taken a deep interest in this particular question. He has been able to fix with considerable certainty the exact age of several varieties of forest trees, and gives the results in the letter already referred to. What the size and quality of the tree may have been, and how far it would have been marketable at earlier stages of its growth may be inferred from its measurements at maturity. The Senator says:—

"In enumerating the trees which I consider desirable for planting, I have

named only those which could generally be obtained without any great difficulty or expense, in almost any part of Ontario, and I shall now give some data, which will show what growth these trees will attain within a specified time, taken from memoranda kept by myself, or which have come into my possession, and for the accuracy of which I am prepared to vouch.

"Elm trees taken from the woods as young trees of about 6 inches round the stem, and between 8 and 9 feet high, have attained, in forty-five years, a height and girth round the stem at 3 feet from the bottom, in several instances as follows:—One 60 feet high, 8 feet in circumference at 3 feet from the ground; one 65 feet high, 8 feet 2 inches in circumference at 3 feet from the ground; one 60 feet high, 7 feet 9 inches in circumference at 3 feet from the ground. Another elm planted about fifty years ago, a small tree from the nursery gardens, has now grown to a height of 70 feet, with a girth at 3 feet from the ground of 8 feet 6 inches.

"A red oak, planted as a sapling about forty-eight years ago, is now nearly 50 feet high, and measures 5 feet 8 inches round the stem at 4 feet from the ground.

"A maple of the same age, is 6 feet 5 inches round the stem, and nearly 60 feet high, and two others planted within the same period, are 6 feet in girth at four feet from the ground, and between 50 and 55 feet high.

"All three of these were, when planted in their present position, young trees about 6 or 7 feet high—just the size at which they can be most safely transplanted when taken from the woods.

"Of beech I have no record that I can entirely depend upon, but I believe one that I measured, which gave nearly 4 feet as the girth at about the same height from the ground, and was about 38 feet high, has been planted over forty years.

"A butternut between forty-seven and forty-eight years old, measured 6 feet round the stem (4 feet from the ground), and has attained a height of 75 feet.

"Of two ash trees planted fifty years ago, one is 60 feet high, with a girth of 6 feet 5 inches; the other about 55 feet high, girth a little over 6 feet (3 feet from ground).

"It will be seen from this memorandum that the elm has made the most rapid growth of all these trees, and the maples come next; although the ash is close upon them.

"Of evergreens (native), I can only give with certainty the white pine. Two of these—both planted fifty years ago—have reached, one a height of nearly 70 feet; the other a little over 60 feet. One measures 6 feet 6 inches; the other a little over 5 feet, at four feet from the ground.

"It will be seen, therefore, that, within an average of fifty years, trees transplanted at just such a size as they can be safely and conveniently taken up when growing in the woods (say from 5 to 6, 8, or 10 feet high) have attained dimensions, which render them very valuable as firewood, as well as being perfectly sufficient for many useful purposes about a farm for which timber of a moderate size is suitable and requisite.

"I do not think that, with such facts as these, it can be said that there is anything visionary or impracticable in the means I have suggested for meeting the coming scarcity of timber in Ontario, and supplying the wants which will soon make themselves felt, even by the present generation of farmers, and will certainly press heavily upon their children, if not provided for in some way or other."

On this very interesting subject, other witnesses before the Commission also gave evidence.

An indication of the periods at which hickory and walnut will be of marketable value may be obtained from remarks made by Mr. Beadle. He says:—

"Hickory trees might be planted quite close together, say three or four feet apart, with a view of thinning them out after they get as large around as a man's arm, because wood of that size would be valuable for many purposes. Black walnut would require to be planted farther apart, because they would be of no use until they were about as large around as a man's leg. Besides it is rather umbrageous in its style of growth, while the hickory is upright."

Mr. Beall, of Lindsay, has experimented with the black walnut. These trees, in fourteen years *from the seed*, have attained a growth of some eighteen to twenty-one inches in circumference, are twenty feet high, and have borne nuts for five years. He says:—

"I would consider black walnut the most valuable of all trees for forest planting. I know it will grow and succeed in this district. I do not know of any person who has grown it or attempted to do so but myself. I have about fifty very fine trees. I have some that will measure from six to seven inches in diameter, and are about twenty feet high. I have grown them from nuts planted in 1866. I know of no tree that will grow so easily, so rapidly and with so little trouble. The trees I mention are bearing nuts now, and I think I observed nuts on them five years ago."

Mr. Leslie says of the American elm and European larch:—

"The American elm, and European larch, would also be suitable for this purpose. The latter makes the best railway ties of any wood in the world, as it is almost indestructible. It is a very rapid grower, and in ten or twelve years' time the wood is of merchantable proportions, and useful for many purposes. Of course it would not be fit for railway ties by that time, but suitable for manufacturing purposes."

Of the butternut and hickory, he says:—

"The butternut is a very fine tree, and a quick grower, a little more rapid in its growth than the black walnut, and is useful in many ways. It makes capital wood for veneering. The hickory is hardy as far north as Peterborough, but is a slow grower, though it can be used for many purposes when three-quarters of an inch or an inch in diameter."

Mr. Caldwell, M.P.P., says on this subject:—

"I would plant elm, maple, ash, and basswood, all fast growing trees, mingled with spruce and cedar as evergreens, as well as pine. I think an elm would be forty to fifty years in attaining to ten or twelve inches in diameter. The soil would have some effect on the growth, but I do not think that either ash, maple or basswood would grow much faster than the elm. A maple eight inches in diameter might be tapped for sugar; I think it would then be twenty-five to thirty years old. "I have not experience enough to speak positively on that point. Lombardy poplars twenty-two years old, measured by me, are from six feet to eight feet four inches in circumference."

Mr. Henry Ives, quoted by Dr. Hough, gives, in the spring of 1876, his experience in a communication to the New York Farmers' Club. He says:—

"Five or six years ago, I planted two acres with four-year-old seedlings of white elm and soft maple into forest rows sixteen feet apart, and three feet apart in the row. Now the best of them are twenty feet high and twelve inches in circumference, and, for thinning out the rows, I sell trees for more money than

wheat would have brought grown for these years, and can continue to sell so until they are so large that I can take them for firewood, and I am growing a good crop of orchard grass between the rows. So that these trees in forest timber are paying as well, and are likely to pay as well for years to come, as any other acres on the farm. I am cutting now the second crop of wood, where the first or original timber was taken off about twenty-five years ago, and last winter 1,000 rails were taken by a neighbour from one-third of an acre of growth, besides a quantity of timber from the top, and timber not making rails. Another neighbour used nice black walnut lumber in building a fine farm-house, sawed from the trees he had helped to plant when a boy."

The value of the white ash has been specially noticed. In a paper, published in the Transactions of the Northern Illinois Horticultural Society, it is shown that, in a ten-acre plantation, raised from seed, at the end of twelve years, with good culture for the first four years, and proper soil, the grove would have 12,000 trees on the ten acres, averaging eight inches in diameter.

Replanting and Ornamenting Farms.

The method to be pursued by the intending tree-planter, as well as his outlay, will depend much both on the particular object he has in view and the money he has to spend. As respects deciduous trees, farmers will generally look to the threefold object of planting merchantable timber, finding shelter and shade for cattle, and beautifying their farms. The deciduous trees—those that shed their leaves annually—are not the most useful as wind-breaks, because it is just when they are bare of leaves protection for the crops is most needed. Nor would the ornamental designs of the planter be attained without recourse being had, to some extent, to the most graceful in an artistic sense of all trees, the members of the coniferous family, such as the Norway spruce, Scotch pine, and others. It will, however, be convenient to notice first the deciduous trees in view of their general utility for the purposes above referred to.

"I would recommend," says Mr. Beadle, "for forest planting, the hard maple, particularly as a tree which will be very valuable yet in our country. . . . I am not particularly partial to the silver-leaved maple, though it is a most popular tree with most planters because it grows so rapidly. The hard maple is a more symmetrical tree, and the foliage is very clean and free from insect depredations."

The last paragraph refers to the planting of trees singly or in rows. Mr. Beadle goes on to say:—

"There are varieties of foreign maples that are very pretty planted along with our forest maples—such, for instance, as the Norway maple."

Mr. Leslie says of these trees:—

"For public roads and purely shade trees the first tree I would mention would be the hard maple. The silver maple is a faster growing tree, but the soft maple proper is of rather slow growth. I would say the silver-leaved maple, the hard maple, and the Norway maple are most thrifty and desirable trees.

"The Norway maple is not largely used yet, but I think it will eventually be the leading tree. I think our native basswood would be a very useful tree for

growing at the sides of roads, particularly in our bee-keeping sections; it is rather a rapid grower."

Senator Allan says:—

"The maple, both of the hard and soft varieties, bears transplanting remarkably well, and grows rapidly."

Mr. David Smellie, of Vaughan, County of York, has gone somewhat extensively into tree planting on his farm. He says:—

"I think it is a very good thing to have trees planted extensively about a farm. I have planted more trees on my farm during the past four years than any one else in my neighbourhood, I suppose. I have planted them along the front of the place, up the lane towards the house, and around my orchards. I should like to have more of them planted. I have been planting the silver maple, but if I were going to plant again I would plant the Norway maple, which is a much nicer tree. It doesn't grow so fast, but it grows a closer and prettier top, and swells out faster in the trunk. It is a pretty rapid grower."

In Kent, the Commissioners noticed that the maple had been very extensively planted on the field sides and concession lines, a circumstance that was the more remarkable from the fact that the original wood of the district had largely consisted of the elm.

Mr. Cochrane, of Kilsyth, County of Grey, another farmer, says in his evidence:—

"I think in the matter of tree planting we are in advance of the rest of the county. The planting by the road-side and along lanes is becoming quite general. The neighbour who lives adjoining my place has planted out, I dare say, 1,000 shade trees. The trees planted by him were chiefly silver maple and rock maple. The first he planted was ten years ago, and they were planted fourteen feet apart. They now meet."

Mr. Beadle says on this point:—

"For forest planting I would recommend maple, taking of course into account the variety of soil. The hard maple does not succeed in all soils, but where it does succeed I prefer it. It flourishes in a dry soil. In wet soil I would use the soft maple. . . . Some little blocks of forest have been planted with maple trees, with a view to their sugar-producing qualities, and some of these have attained a diameter of six or eight inches and a height of thirty or forty feet. They have been planted some years. I do not think they received any cultivation after planting."

The elm is strongly recommended by Mr. Beadle. He says:—

"I know of nothing more beautiful as a shade or ornamental tree than a well-grown elm. In New England, and especially in the towns and villages, these trees were planted very early in the settlement of the country, and some of the streets are just arched over by these elms, and walking under them you can imagine that you are in some arched Gothic cathedral, built many years ago, with the columns only left standing. They certainly make a most beautiful sight."

The elm, it will be recollected is stated by Senator Allan to have matured earliest of the several trees included in his list of experiments. Mr. Leslie also mentions the elm as a tree very desirable for planting.

The cultivation of the black walnut is universally recommended. Mr. Leslie says:—

“In the nut trees, the black walnut grows very rapidly in its younger stages—almost as rapidly as the English ash, and, at fifteen years, the wood could be used for many purposes, particularly for cabinet-making. I think the black walnut would have to be confined chiefly to the front of the Province. I never saw it east of Cornwall, but the south-west portion of the peninsula is its home.”

That the walnut is not a tree requiring an exceptionally mild climate is proved by the experience of Mr. Beall, at Lindsay, already quoted. Mr. Roy too, at Owen Sound, says:—

“There is an idea that black walnut will not grow as far north as Owen Sound. Ten years ago I planted black walnut seeds, and at the present time two or three of the trees bear nuts. They are not only ornamental, but coming to be very useful trees. The diameter of two or three of them now will be as much as six inches. They were planted in a strong soil.”

If the soil is at all good, Mr. Arnold recommends the planting of the black walnut on lands that may, for any other reason, be unavailable for agricultural purposes.

The butternut, as already noticed, is recommended by Mr. Leslie for planting. Senator Allan says of it:—“The butternut if transplanted young succeeds well.”

It is somewhat more hardy than the walnut, and, as previously mentioned, is often used as a substitute for that wood.

The hickory is rather a slow grower, but can be used profitably at so early a stage in its existence that it is a profitable tree to plant pretty freely with the view to the sale of thinnings as the trees mature and crowd one another. Mr. Beadle says:—

“I have not the slightest doubt that plantations of hickory will pay in the near future.”

The ash can be easily transplanted, and, as a fast growing tree, for the wood of which the demand is certain to increase with time, is one that should be cultivated. Mr. Beadle says of it:—

“The ash will always be valuable, particularly the white ash.”

Mr. Leslie recommends the English ash as preferable to some Canadian varieties. He says:—

“For tree planting on waste lands, or hillsides, with an economical view, I would recommend the English ash as a most useful tree. I think it would come into the market earlier than any other tree that could be planted. It is largely used for handle-making, and about ten years' growth on ordinary soil would produce a tree that could be split into four pieces, each of sufficient size to make a handle. The English ash is not the same as our common black ash; there is as much difference as between the European larch and our tamarack. It is a more rapid grower than the black ash, and the wood is better in every way.”

The Lombardy poplar, which is an exceedingly fast growing tree, may be utilized for other purposes than shade, as will be seen by the following quotation from Mr. Leslie's evidence :—

“Some people like the Lombardy poplar and some do not. It does not harbour insects, on the contrary it is a very clean tree, but in this climate it is apt to die, and to become ragged at the top. In the latter case, however, if cut every few years it will grow more handsome with each cutting. It is being largely used for shelter purposes.

“The Northern Railway have ordered some thousands, and are putting them up along the line instead of fence posts, and using barbed wire to form the fencing. The wounding of the tree does not do it any harm.

“On the prairies of the West, they are used, too, to a great extent without the barbed wire. The trees are planted six feet apart, and when they have attained a sufficient height the top is cut off and nailed laterally from tree to tree as a barrier. By the time the top, thus placed, has decayed, a new one will have been formed on the tree.

“I think the height at which poplars for such purposes should be planted is immaterial; it is merely a matter of expense, as the tree has undoubtedly great vitality. They seem to grow as well if planted when they are as large as your arm as they do when they are the size of your little finger. In seven or eight years it becomes a tree of thirty feet at least.

“Our balsam poplar is not a very handsome tree, but it makes a good shelter. In localities where you do not want to cultivate anything, it can hardly be recommended for ornamental purposes.”

The basswood, growing rapidly and being in demand for various economical purposes, is now also being cultivated in connection with bee farming, its flowers yielding an extraordinary crop of honey of the finest quality.

The tulip (or whitewood) tree, is strongly commended by Mr. Beadle to the attention of all who may live within the area in which it can be successfully cultivated. He says :—

“We have also the whitewood tree, which is used by carriage-makers in making bodies of carriages. The most of that tree grows in the Niagara District. There are beautiful trees of it in our district, many of them being nearly as large in diameter at the top where the branches come out as at the bottom; some of them must be fully forty feet high. I think it is one of our most handsome ornamental trees, and I have often wondered why planters of ornamental plantations have paid so little attention to it. It makes a very symmetrical tree on a lawn, and about this time of the year it comes out in tulip blossoms which have a pleasant fragrance. The leaves are remarkably bright and green, and free from insects. Though it is difficult to transplant the tree, if you begin young you can accustom it to transplantation. The root is very unlike most of our forest tree roots, it is a very fleshy root, more like that of a vegetable.”

The tree is found in large quantities in Kent and Essex, and can probably be profitably grown in the whole of the southern half of the south-western peninsula, except, perhaps, in a few very exposed situations.

The beech and birch are graceful trees, and some of the varieties of both such as the cut-leaved birch and the purple-leaved beech and birch are extremely beautiful. For black birch there will be a future market for cabinet purposes, while, if only for fuel, the beech is useful.

The willow is a tree that very quickly supplies the need of shelter for cattle and a protection, if closely planted, against cold winds. In Iowa, the willow has been used to a large extent in the construction of wind-breaks and shelter-belts on the prairies, and with great success. The willow has its economical purposes besides. Mr. Galusha, already quoted, says of the use of the willow :—

“I regard this as probably combining more desirable qualities for cultivation in groves, for lumber purposes, than any other variety of soft-wood, rapid growing, deciduous trees, and am decidedly of the opinion that this and the golden variety are the best deciduous trees within my knowledge, for wind-breaks or screens, but wish to be distinctly understood as not recommending this tree as a hedge plant, or the planting of this or any other sort, to the neglect of other desirable varieties. Strong cuttings of this tree seldom fail to strike root at once in mellow soil, and will make a growth of from two to six feet the first season. It thrives in all kinds of soil, making as much wood in a given number of years, as any other known sort, not even excepting the cottonwood, growing into a large tree sometimes four feet in diameter. The wood is of rather fine texture for a light wood, making a fair article of soft lumber, which bears a high polish. It is also valuable for making wooden-ware, bowls, trays, etc. It also splits freely, which is a desirable quality in making fence posts, rails, railroad ties, and firewood. . .

“The golden willow is similar in texture and growth to the white, but I think it does not make so large a tree. I have measured half a dozen trees of this variety (golden) which were planted on the roadside 15 years ago last spring, and find the average circumference of the trunks at three and a half feet from the ground to be 5 feet 3 inches. A white willow which has grown from a small cutting put in 13 years last spring, now measures 6 feet 2 inches, near the ground, forming a head on top 30 feet across. This variety, when planted in groves, grows tall and almost perfectly straight. I have carefully computed the expense of raising ten acres of trees of this variety and converting them into lumber, and find the entire cost not to exceed \$10 per 1000 feet. This estimate is based upon actual measurement of the growth of the trees. The land itself is valued at \$40 per acre, with interest upon this amount, together with expenses computed as before at 6 per cent., compound interest. I take ten acres in these estimates of growing artificial groves, because it is desirable to have trees enough together, or in close proximity, that the cost of putting up and removing a saw-mill would be but a trifle upon each thousand feet of lumber sawed.”

Of the coniferous trees none is more beautiful, and none can be planted of a more certain economical value, than the native white pine. Mr. Beadle says of this tree :—

“I believe that plantations of white pine will eventually pay when our timber regions to the north become used up or burnt up. The white pine grows rapidly.”

Mr. Dempsey says of it :—

“Pine makes rapid second growth in sections of the country where it flourishes.”

Mr. Beall says of this tree :—

“We should not forget our native pine, for there is no more beautiful tree we can have if taken from the woods when very young.”

Where, however, it is desired to plant in uncultivable ground, few, if any, trees will be found of greater value than the European larch. Mr. Leslie, speaking of this tree, says :—

“I do not approve of our Canadian tamarack at all. The timber is poor, and if people desire to go to the expense of planting for timber, I would recommend them to plant the European larch, which is a splendid tree, a rapid grower, and will grow in any part of this country. It is not an evergreen, but it throws out a great number of small branches which are a great protection. It is a very rapid growing tree, even more rapid than the Norway spruce, growing more than four feet on an average every year, unless the ground is very poor, in which case of course the growth will be less. In five or six years the tree will be twenty-five or thirty feet high.”

After mentioning it as an ornamental tree for lawn planting, Mr. Leslie says further :—

“The European larch would also be suitable for this purpose (handle-making). The latter makes the best railway ties of any wood in the world, as it is almost indestructible. It is a very rapid grower, and in ten or twelve years' time the wood is of merchantable proportions, and useful for many purposes. Of course it would not be fit for railway ties by that time, but suitable for manufacturing purposes.

“It would be decidedly profitable to railway companies, as well as beneficial to the country, if the waste lands connected with their lines were planted with European larch. From this source they could in time obtain an almost inexhaustible supply of railway ties, much superior to the kind now in general use.

“Another use to which the European larch can be put is the production of ‘ships' knees,’ as it can be trained when young to the desired bend.”

It was the European larch with which successive Dukes of Athol carried out their extensive tree-planting operations in Scotland, extending at last to an area of 10,000 acres, and involving the planting of no less than 14,000,000 trees.

Mr. Roy, of Owen Sound, says of this tree :—

“I have tried the European larch, which is much more pendulous [than the pines]. I have had no difficulty in establishing it here. It is a most beautiful and ornamental tree. I obtained it from Scotland.”

The larch is not an evergreen, but, when planted in groves or belts, several trees deep, offers, from its conformation, a very considerable resistance to the winds.

For a perfect shelter belt for orchard or fields, however, nothing is more strongly recommended than the Norway spruce. Mr. Leslie says of it:—

“We consider the Norway spruce the most valuable tree there is for planting in shelter belts. It is extremely hardy, very rapid in growth, and easily transplanted.” He adds, “I prefer the Norway spruce wholly to deciduous trees and evergreens mixed, as in the latter case, the one checks the growth of the other.”

Mr. Beadle speaks of the Norway spruce as

“The cheapest and most easily procured of evergreens.”

“Norway spruce,” says Mr. Allan, of Goderich, “makes the finest close screen. It would suit finely round an orchard or barn-yard.”

Senator Allan says of it:—

“Of these nursery trees, the Norway spruce fir is certainly one of the handsomest evergreens, and most desirable in every way. It is very hardy, of quick growth, and adapts itself to all situations, and what is a great recommendation, does not, like the balsam fir, and some other of our native spruces, lose its lower branches and become thin and scraggy below as it increases in age.”

The Norway spruce is, of course, an imported tree, and must be obtained through the nurseries.

But there are many native varieties of spruce, which, if not in every respect so desirable, are near at hand, and can be made to do duty very efficiently. Mr. Beall says:—

“By spruce I mean the kind that is called the Canadian or black spruce. It varies much in colour. I bought a thousand plants of Canadian spruce a few years ago. I consider it superior to the Norway spruce, because it is equally as pretty in shape and it has a better colour. With the Canadian spruce we get almost every variety of shade, but the Norway is all one shade. I suppose the different shades are all of the one variety, but they differ during their life. They can be cultivated successfully in rows, with the branches interlocking in the way described by Mr. Beadle. I have a fine close-cut spruce hedge about five feet high, pyramidal in shape, and five feet across at the base. It can be pruned beautifully, and we have now every shade and colour, from the palest yellow to the deepest green. It does not grow so fast in the open ground as the Norway spruce, though I have trees, planted twelve years ago, off of which I cut the tops five years ago, and they are now eighteen or twenty feet high. I do not know how the Canadian spruce compares with the Norway spruce in merchantable value. It will grow almost anywhere. I would plant it along with cedar or pine on hill-sides or rocky places.”

Of the Canadian white and black spruce, Mr. Leslie says:—

“We have found the white spruce, a native of this country, a most excellent tree for shelter belts, but it is not so rapid a grower as the Norway, and for that reason the latter is superior. We have a black spruce, but it is not a good variety, as it is apt to become poor at the bottom; that is, in the early stages of the growth of the tree the lower limbs decay and are lost, while the white spruce and the Norway hold their foliage to the ground. When I speak of shelter, I mean shelter for farm buildings, orchards, etc.”

The Scotch pine, the Norway spruce, and the Austrian spruce are all beautiful trees, and very easily transplanted. Mr. Leslie says of them :—

“The Austrian and the Scotch pine are both fine trees ; they do not grow quite so rapidly as the Norway spruce, but they are good for shelter purposes and make a pretty diversity in a belt, nearly keeping pace with it in growth. They cost about the same as the Norway spruce. The latter variety, and the white spruce are both fine ornamental trees.”

Of the *Arbor Vitæ* Mr. Leslie remarks:—

“Of evergreen trees, the most useful for ornamental purposes, is the *Arbor Vitæ*, in its three varieties ; the American, the Siberian, and the Tom Thumb. Taking the Province as a whole, the Virginian cedar does nicely, still I can hardly recommend it, as it is difficult to transplant.”

He adds further :—

“Coming to the more ornamental trees, I would recommend, of the coniferous class, our native American *Arbor Vitæ*, or white cedar, which is an excellent tree, and the white spruce. The balsam spruce I cannot recommend at all. It is a very pretty tree, and has very handsome foliage until it is about twenty years old, when it gives out altogether. The *Arbor Vitæ* is a very long-lived tree, a moderate, though not fast grower, requires a moister soil than the Norway spruce though I have seen it thrive very well on a dry soil.”

Mr. Beadle remarks :—

“There is quite a list of evergreens, each possessing a peculiar beauty of its own. The cheapest and most readily procured is the Norway spruce ; next to that are perhaps the Austrian pine, the Scotch pine, and the Oriental spruce. I don't know whether Nordman's fir is going to prove successful or not—I am afraid it is tender, except where the peach tree will thrive. Then there are some of the Rocky Mountain pines which are giving good promise of being valuable ; they seem to be perfectly hardy. I would plant our own native white pine amongst them ; it is about as beautiful a tree as we have. The reason it is not planted with us is that it is so common, but where it is allowed to grow out in the open it makes a beautiful tree. Of the smaller growing varieties I would recommend the juniper tribe—the Irish and Swedish particularly ; I prefer the Swedish, because it is hardier. There are varieties of the *Arbor Vitæ*, which have characteristics that make them interesting ; there are some tipped with white, giving them a silvery appearance, and others—the golden ones—with yellow foliage. The box tree injures badly with us in the winter, but I should say that in Ottawa and other parts where the snow comes early in the fall and lies late in the spring affording protection to the tree from the heavy frosts, it might be used for edgings etc. We use as a substitute the dwarf *Arbor Vitæ*, such as Hovey's, the heath-leaved variety, Parson's *Arbor Vitæ*, all of which are valuable, though differing from each other in their style of growth.”

The *Arbor Vitæ* and hemlock make admirable shelter belts and good hedges Mr. Roy says :—

“A good hemlock hedge can be got by taking young hemlocks from the bush and replanting them two or three times. . . . The younger you get the hemlocks the better.”

After suggesting the Mountain Ash, Maiden Hair tree (*Salisburia*), the lindens (European and native), the Cut-leaved Alder, and the fern-leaved Sumach as very useful trees for ornamental purposes, and alluding to the *Arbor Vitæ* as above quoted, Mr. Beadle gives a list of other evergreens and shrubs that may be used for beautifying rural homes and gardens. He says:—

“I have not tried the American yew to any extent; I have seen it growing after transplantation, and it thrives well. The *Mahonia aquifolia* suffers from our winters if it is not covered with snow. It is not killed, but the leaves are browned and the beauty of it destroyed until new leaves come out to hide them. When it is protected by snow it does well and is a pretty tree. The *Retinosporas*, or Japan cypress, I have not had much experience with, though some trees of that variety seem to promise well. There is a large list of flowering shrubs valuable for our planters, some of them native. The Florida dog-wood (*Cornus Florida*) is grown by some. It is a very pretty tree while the bloom lasts, and it lasts a good while; the foliage afterwards is very pretty. In the autumn the foliage turns into beautiful colours, in which scarlet and purple predominate, and the berries are also very pretty. The flowering thorns are beautiful trees, belonging to the hawthorn family. When the trees are covered with bloom the air is filled with fragrance. As to their hardiness, they do not suffer much with us, and if they suffer at all it is not from the cold but from the sun. I have seen the bark on the south side of the tree dried up, and I supposed it was from the action of the sun. I do not prune up my thorns, but let the branches grow close to the ground, and the trunk being shaded by that means, the tree grows finely. Then there are two or three varieties of the Japan quince—I prefer the scarlet-flowered variety; there is also a pink-flowered variety, with blossoms something like the apple. Both of these varieties are very beautiful; they flower early, before the leaves come out, and are an interesting sight early in the season. After the flowers drop, the leaves come out; they are bright, glossy green, neat, clean, and free from insects. In autumn the trees are laden with golden fruit, which is pretty to the sight, but very acid. I don't know that it is of any use. The slug does not trouble the leaf with us. Another class of flowering shrubs are the *Spiræas*; there is a great variety of them. The most prominent is the plum-leaved spiræa; the flowers are double, pure white, and in the autumn the foliage becomes purple, scarlet and crimson. There are varieties of weeping elms, such as the Camperdown elm. They are made by grafting the Camperdown on the Scotch at standard height. There is also Young's weeping birch; you have to graft it at standard height, and then it will grow horizontally and downwards. I forgot to mention the Weigelias, which are perfectly hardy with us, and are very beautiful. Another advantage which some of them possess is that they bloom the second time; they blossom first in June, and then in August or September. In some sections of the country the *Althæa* makes a beautiful shrub. The *Deutzias* I also esteem very highly; some of them are very low shrubs, and can be used in the smallest city grounds; others are larger, and grow to the height of twelve feet. The *Deutzia crenata* is very pretty. There are also varieties of the honeysuckles and clematis which are very beautiful, and make fine plants for climbing up pillars or verandahs. Some of the clematises die down in winter, but if they are cut down at the crown they will grow up again next spring and flower all summer long. They have been used in England for bedding purposes by pegging them down and letting them creep over the bed. There are two or three varieties of the *Lonicera tartarica*, which are very pretty; they are very showy when in bloom, and are easily cultivated.

Cultivation of Forest Trees.

The mode of cultivating forest trees is the next matter to claim attention. This may be accomplished either by raising trees from the seed, or from cuttings, or by transplanting them from the nursery or the woods.

Raising Trees from Seed.

If it be desired to raise trees from the seed, attention must be paid to the time of gathering, management, and planting. The soft and silver-leaved maples and elm mature their fruit in June; the sugar, Norway, sycamore, and some other maples, ripen their seeds later in the season. Acorns, walnuts, chestnuts and other nuts ripen in the fall. All seeds should be sown as soon as gathered, but the fall seeds may, if more desirable, be kept in a box mixed with sand until the following spring. Acorns and nuts being liable to be disturbed by squirrels are often preserved in this manner. They should be kept in a cool place, and where they will not become too dry. The elm and maple if favourably situated will make very good growth in their first season, when sown immediately after gathering. Red cedar berries should be bruised in March, and mixed with a quantity of wet wood ashes. In three weeks the alkali will have cut the resinous gum, when the seeds can be washed clean from the pulp and planted.

Seed Beds.

In preparing seed beds, the ground should be dug for a foot or more in depth and a liberal dressing of well-rotted leaf-mould, (or wood soil) and sharp sand applied. The beds should be laid off about four feet wide, screened and if necessary occasionally watered. The drills should be so arranged as to admit of cultivation. At the end of from one to two years, according to circumstances, the young trees may be transferred to nursery rows, and in a couple of years more planted out in their final position.

Transplanting from the Forests.

But many farmers will prefer a less tedious and equally cheap method of acquiring a stock of young trees. Mr. Bucke of Ottawa, gives some useful hints on this head:—

“There has been a good deal of talk before the Commission about growing trees from the seed, but if I were going to plant trees, and particularly maples, I would go into the woods and pull up seedlings a few inches high, as I am convinced they will succeed better than by any planting of seeds. I planted a number in that way, and they are the best lot of young trees I know of. I planted them in nursery rows, about six inches apart in the row, and I have succeeded in raising a large number without losing any. I trimmed the roots before planting. There are both hard and soft maple found in the ordinary maple bush, and I think birch could be propagated in the same way.”

Mr. Bucke further stated he had collected and planted elm seedlings in the same way as the maple. Seedling trees thus taken early from the bush, should be kept in the nursery rows for a couple of years and then planted out. With regard to the spruces and other coniferous trees, Mr. Leslie says:—

“There is no difficulty whatever in transplanting these trees from the woods when young; it is simply a matter of keeping the roots moist while out of the ground. I would recommend that they should always be planted in nursery rows before being permanently placed in position, and if they have ugly tap roots these should be cut off. I would not recommend that the tops should be cut, there is no necessity for doing so, and it destroys the symmetry of the tree. There is no necessity for cutting the tops of deciduous tree seedlings.”

Mr. Arnold says on these points:—

“Unless trees have been prepared by transplantation, the smaller they are planted the better. They should not be over a foot high unless they have been so prepared. After they are planted I would cultivate the soil the same as for corn or potatoes. I would plant the trees at first with a view to thinning them out. As to the cost per acre, the small trees could be supplied for five dollars per hundred. The planting would be about five dollars per hundred, that is, for nurseryman's trees, about one and a half feet high. I would not recommend the planting of such small trees, but I would have them properly prepared to plant when they were two or three feet high. They would then cost about twenty dollars a hundred when planted. Some varieties of oaks, walnuts, etc., could be raised from the seed by farmers if they attended to the matter, but I find it more profitable for me to send and buy my trees one or two years old from those who make a business of raising them. The raising of forest trees from seedlings is a business by itself. It would pay better to import some from France and England than to grow them, as they have to be shaded. Young trees should be grown in a seed bed, before being planted out, about two years, and then should be re-transplanted every two years until they are put where they are to remain.”

Of trees of a larger growth than seedlings in their first or second year, Mr. Roy says:—

“In transplanting trees the smaller the better. If you get a tree four or five feet high you may replant it, but my experience is that the sooner you begin to transplant the trees the better. I usually transplant fruit and other trees in the fall. The strongest and almost only reason I have for transplanting them then is that I have more time to do the work then. I think it is a good thing to cultivate around a tree. I don't think it is good to cultivate around a peach tree in a rich soil, because the tree gets too much wood in the fall, and the frost comes on and kills it before the wood hardens. As regards forest trees, I think they would succeed better for a few years if cultivated around. After they get fairly growing I don't think cultivation would be required.”

Senator Allan on the replanting of forest grown trees remarks:—

“Take, however, even an ordinary sized farm, say of 200 acres, and if planting is to be carried on to any extent, trees from the nurseries will be found rather too expensive a luxury, and the farmer must rely upon what he can obtain from the nearest woods.

“These—if carefully transplanted, and in the case of evergreens more especially, of not too large a growth, when moved—ought to succeed perfectly, or at least there should be a very small percentage of loss.

"Of our native evergreens, the white pine, black and white spruce, and white cedar, can all be easily transplanted.

"The red or Norway pine, than which there is no handsomer tree when allowed to grow singly and with plenty of room for the spread of its branches, is very difficult to move, and will not generally succeed, unless taken up with great care when very young.

"The hemlock spruce, one of the noblest and most picturesque of our native evergreens, is of very slow growth, and is also difficult to transplant, except when very young, but both it and the white cedar make most excellent hedges.

"Of our deciduous trees, the elm, ash, beech, oak, and maple, are the most generally and easily obtainable. The maple (both of the hard and soft varieties) bears transplanting remarkable well, and grows rapidly. The different varieties of elm can also be easily moved—so also the ash. The oak, both white and red, as well as other varieties, is difficult to move with safety, and is of less rapid growth than either the maple or the elm.

"The butternut, if transplanted when young, succeeds well. The walnut and sweet chestnut I have no experience of, except as transplanted nursery trees. Take, however, all the others I have named, both evergreen and deciduous, and they can generally be obtained in most parts of Ontario, without having to go any great distance to find them."

As the tree to be moved increases in size the more care, is needed in its treatment. It is a good plan to select trees growing as near the edge of the woods as possible; their situation having been less sheltered, the exposure to which removal subjects them is less felt. As to the preparation and removal of forest trees Mr. Arnold says:—

"We prune the roots with a spade. In the case of trees which have not been transplanted, and trees, say four, five, or six feet high, which have not been moved lately, we send out a man in the spring to cut off the roots about a foot from the stem. In the fall, in digging them up you will find abundance of fibres, and unless this is done it is dangerous to remove them at that age. If people transplanting from the forest would go about this time (June) and cut off the roots a few inches from the stalk, and go next year and dig them up, they would find no difficulty. In moving trees it is better to cut off the tap roots. For instance in growing peaches it is the practice of many to put peach seeds in sand in the greenhouse until they germinate. There is a long tap root which we pinch off, and when we take it up afterwards we find a mass of fibres. In fact the tap root is not essential to the future growth of the tree. As to the branches, I would not touch them until I came to transplant. When we dig them up we have to cut off a portion of the roots, and it is necessary to take off about the same proportion of the branches. The root vessels cannot draw sap enough to supply all the leaves unless this is done. The reason I would give for pruning with a spade is, first, that it prevents injury to the root while the tree is being finally moved; second, it produces large growth of small fibrous roots within a limited space, and this adds to the nourishment of the tree."

The distances apart at which trees are planted, when set in rows for ornament, or shelter for cattle in fields, will have to be decided by the nature of the tree, and will run from ten to thirty feet, according to circumstances. For forest planting, the trees being in that case small, they may be planted from three and a half to four feet apart in each direction. This will admit of cultivation by horse power.

As the trees grow they will be thinned out, any easualities, on the other hand, being supplied by new plantings.

In Dr. Hough's report the following table is given, showing the number of trees upon an aere at a given distanee apart, and the number that might be left at different ages, with the proportional value of the thinnings taken at the several ages:—

AGE.	Distance apart.	Trees to the acre.	Proportional value of each trimming to total trimming.
	ft. in.		per cent.
10 years.....	3 9	3,097	3.4
15 “	4 0	2,792	5.2
20 “	4 3	2,411	6.5
27 “	4 7	2,077	10.5
35 “	5 6	1,440	23.6
43 “	6 6	1,031	23.7
51 “	8 0	680	27.5

In regard to the growth of woodland a high European authority remarks:—

“That, while an uncultivated woodland, taken for a long period, and counting interest and taxes, would yield almost nothing to the capital invested, it is well established that the same land, managed according to modern science, would, in the long run, yield a revenue both conspicuous and constant.”

Construction of Shelter Belts.

For sereens and shelter belts where evergreens are used, Mr. Leslie gives the following advice:—

“Trees for this purpose would not require to be of great height. If farmers consulted their own interest, I think they would commence by planting out small stock, say from 12 to 18 inches high. These trees grow very rapidly, say, on an average, three feet every year for the first five years, gradually lessening there-after, and in a short time the farmer obtains a good shelter.

“As we get these trees (Norway spruce) from the old country, they are two years in the seed-bed, and two years transplanted. That brings them from 12 to 15 inches in height, and nicely rooted. When received in good condition we do not lose one per cent. in transplanting them. If in poor eondition, they are transplanted before being sold, and get a couple of years in this eountry, and are then removed. The tree is thus, in the latter case, six years old from the seed when planted for the purposes of shelter.

“All that we have ever sold have been raised in the old eountry (Scotland). We find it much cheaper to import them than to raise them from the seed. Our elimate is a little against raising evergreens from the seed; the sun is apt to scorch and kill them when in their early growth. In the moist climate of the old country they can be grown with much less care, and are raised and sold by millions.

“In planting a shelter belt, say an aere deep, the trees would not require to be

placed closer than six feet apart; at that distance they would interlock in a few years. At six feet apart, about 1,200 trees per acre would be required, and they could be planted very cheaply by running furrows with the plough lengthwise and then across, placing the trees at the intersections of the furrows. This would give the trees sufficient depth; in fact, I would rather earth up a little than plant too deep.

"I consider a good shelter belt can be made with evergreens two deep, placed say ten feet apart, with a distance between the rows of five feet, and the trees placed so as to break the spaces of the rows. A shelter belt made in this way on the north side of a square ten acre field would require 130 trees, and for both north and west sides double that number."

Mr. Leslie adds:—

"I prefer the Norway spruce wholly to deciduous trees and evergreens mixed, as, in the latter case, the one kind checks the growth of the other."

Mr. Beadle also notices the fact that, while the lower branches of other trees if they were allowed to interlock, would die in a few years, the Norway spruce becomes closely interwoven without the least injury, and forms a hedge so perfect the wind will hardly play through it at all.

Planting out Evergreens.

With regard to the planting and removal of nursery evergreens, Mr. Beadle says:

"As a rule it is more difficult to transplant evergreens than deciduous trees, just because the foliage is always present in the evergreens, whereas you can plant the others when it is not. But by taking evergreens just in the beginning of the spring, before they start into growth, if the season is not exceptionally dry, they are easily transplanted. The secret of transplanting them successfully is to transplant them when they are quite young, then let them stand for two years, take them up and set them further apart, give them two years more and then transplant them again. If evergreens were transplanted four times before they came into the hands of the purchaser they would hardly meet with a death. But most men would sooner pay a few cents apiece for trees which have been transplanted once than pay a higher price for trees which have been frequently transplanted. Our people have not yet been educated into a knowledge of the difference as they have been in Europe."

Mr. Leslie makes a very similar suggestion. He says:—

"My advice would be, unless the ground is in extraordinarily good condition, to take the young trees as they are received from the nursery and make nursery rows of them, give them a little care until they arrive at the height of 18 inches or 2 feet, and then put them into permanent position. They would require from two to three years to grow to this height, and would then be a good size to transplant. After that their ordinary growth is two to three feet per year in good soil, and fully two feet in any soil, so that in six or seven years the farmer would have a good shelter."

Planting Waste Lands.

For planting on waste lands, either inaccessible to cultivation or of a soil too poor to repay cultivation, the European larch has already been mentioned. Mr. Leslie, referring to this tree, says:—

“It is suited to our climate, being perfectly hardy, and very easy to transplant in the spring. It requires early transplanting, though later in the season it will thrive if transplanted, provided the roots are kept moist. As a rule, however, it should be planted as soon as the frost is out of the ground, or as late in the fall as possible before the permanent freezing of the ground. It can be imported at about the same price as the Norway spruce.

“I would not recommend planting them after they attain a height of more than eighteen inches or two feet; they are a little impatient of being moved after that time. There is not a large supply of them kept in this country, we keep a fair supply ourselves. If very large quantities were required, as for instance, if railway companies should go into their cultivation, they would have to be imported to meet the demand.

“The firm of Douglas & Co., Waukeegon, in the States, grow them by the million. The prices in the old country, however, are less than those in the States and in either case there is a duty on the trees when imported here.”

For belts, Mr. Leslie would plant European larches three or four deep.

“Hitherto,” he says, “the tree has been used more for shelter than anything else. I have no doubt of its success under good management. In our own place we have some trees thirty feet in height.”

Cost of Tree Planting.

With regard to the cost of trees purchased from the nurserymen Mr. Beadle says:

“As to the cost per acre of such forest planting, young black walnut trees can be bought of the nurserymen who have been growing them, at about \$12.50 or \$15 per hundred for trees about four feet high. Chestnuts could be bought at about the same figure. I know of no plantations where the hard maple, could be bought at any figure. Nurserymen have confined themselves mostly to the horse chestnut and mountain ash for tree planting.”

Mr. Leslie says:—

“The American elm, the Scottish elm, and the English ash are also very desirable. Those that I have named I regard as the very choicest. In large numbers I imagine these trees could be got for about twenty-five cents apiece, when about eight feet in height, which I regard as the proper size for planting. They would be trees raised in this country, but they would have to be nursery grown, or transplanted from the woods.”

Of the cost of Norway spruce Mr. Beadle says:—

“It is grown by nurserymen both in Europe and America by millions. They can be bought from one to two feet high for \$10 to \$15 a hundred, and if taken younger can be bought for still less.”

Mr. Leslie, on the same point, says:—

“We sell these imported trees at from \$30 to \$40 a thousand—three or four

cents apiece—that is to say the 15-inch ones. The 18-inch ones would be transplanted two years in this country, and cannot be sold for less than \$60 a thousand. If large numbers were taken they could be sold at a much cheaper rate, say 25 per cent. off. If we could depend upon getting them every year in the same condition, they could be sold cheaper still, but we have to take an average.”

The difference in age and size is, of course, an important factor in calculating the cost. Dr. James Brown in his evidence says, with regard to the cost of imported trees:—

“ I have been just now at Leslie’s nurseries, and find there that such plants as the Scotch pine and other sorts of pine would cost about five cents each. To plant an acre at that rate would cost \$50 for plants alone, independent of planting them. This rate is reckoned when planting the trees six feet apart. I think I would advise planting them as close as that. I don’t think there is any reason why the price could not be greatly reduced by having extensive nurseries, in fact there is no doubt about it.

“ Mr. Leslie said that if he had extensive orders for them he could afford to sell them cheaper, but at present he has no encouragement to do so. In the matter of reclothing the country with forest trees, the first thing essential is to establish large nurseries for the purpose of raising young trees. I think that trees suitable for replanting could be raised so as to sell on an average for \$8 a thousand.

“ You can get the same plants in Scotland for a third of that. The difference between the price here and there would be owing to the difficulty of rearing them here on account of the severity of the winter. In Scotland they require no protection, but they would require to be protected here while they were young.”

In reference to the question of cost, Mr. Leslie in his own evidence repeated the remark he had made to Dr. James Brown. There can be no doubt that trees can in large numbers be grown at a very small cost indeed, but, so far, in Canada, between the very limited amount of planting that has been going on and the accessibility of woodlands affording a cheap supply of trees of some sort or condition, the nursery demand has been comparatively insignificant, and no sufficient encouragement has been given to induce nurserymen to raise forest trees in great numbers. As to the actual cost of planting a given area Mr. Leslie says:—

“ The trees would cost about 5 cents each, say 6 cents with the planting. In other words, the north and west sides of the field could be protected at a cost of very little over \$6 an acre, or say \$7.50 with the planting.”

In his evidence on general farming and other subjects, Professor Brown of Guelph, gave the following as his estimate of the cost of planting out forest trees, and his opinion as to the mode of planting. He said:—

“ Upon the subject of forestry, I will show you what it costs per acre to put down young trees taken from your own or a neighbour’s bush, a method of replanting which can be adopted at the least possible expense, and I think with the greatest possible success.

“ In selecting trees for replanting, it is best to keep on the small side. It is a great mistake to go into six or eight feet trees if you want rapid success. Two or three feet trees will ultimately do much better. I think it is an important point gained if we can show the Canadian farmer how he can be his own nurseryman and do his own replanting.

‘There are thousands of young trees in every farmers’ neighbourhood which need cost him nothing but the expense of collecting them. If he has to pay ten cents to a nurseryman for every tree he plants, he will do very little in that way.

“I have been in the habit of planting one and a half million of trees a year and they did not cost more than ten shillings and sixpence a thousand, and if our Government or private parties took the nursery management of such trees, I think they could be produced in Ontario at less than eight dollars a thousand.

“I have started an experiment upon this subject upon the Model Farm at Guelph, and I have found the cost to be as follows per acre:—

Clearing and preparing the ground.....	\$9 44
Digging pits.....	8 88
Fencing.....	4 75
Planting.....	11 50
Pruning.....	0 75
Mulching.....	2 25
Taking trees from the forest.....	18 50
Heeling.....	0 50

Total cost.... \$56 57

“If the farmer does not estimate the value of his own labour, and of the labour of his horses, you may reduce that about one-half.

“I do not believe in manuring forest trees—I have never seen any good effect from it, and I am expressing not only my own experience, but the experience of others dating fifty years back.

“We have had evidence of great weight that trees should not be planted less than six or eight feet apart, and that gives about 900 trees to the acre. We planted that number this season, and there are now 715 alive and doing well, showing an actual death-rate of one fifth. The deaths, however, occurred principally among the pine and spruce, apart from these, the deaths were comparatively few.

“In planting strips of wood for the protection of crops, I cannot recommend anything but standard trees.”

Ornamental Planting.

For ornamental planting, taste and good judgment must be the planter’s guides, as well as the means he has at his command. Enough has been said to show that, in our native woods, we have enough to add a charm of beauty to every rural home, and to afford a most pleasant and delightful recreation to those who engage in the work of ornamentation.

Effects of Forests on Moisture.

The effects of forests on rain and snow fall is a subject that has attracted much attention in some European countries, and is admitted to be one that is being practically illustrated in our own experience, although, up to the present time, no such system of experiments or inquiries have been adopted as to identify, with scientific accuracy, the relations of the clearing of the land to diminished moisture. Still, everybody mentally attributes the latter result to the former cause. Something more may be said in regard to this matter when the evidence on meteorology

in relation to agriculture is under review. Meantime, the following extracts from the report of Dr. Hough, already referred to, will describe, in a few words, the part played by forest trees in relation to this branch of nature's economy :—

Influence of Woodlands upon Streams.

“ It is a matter of common remark that our streams diminish as the woodlands are cleared away, so as to materially injure the manufacturing interests depending upon hydraulic power, and to require new sources of supply for our State canals, and for the use of cities and large towns. Many streams once navigable are now entirely worthless for this use. The mode in which this influence operates will be readily understood when we consider the effects of forests upon the humidity and temperature of the air.

“ A deciduous tree, during the season when in foliage, is constantly drawing from the earth, and giving off from its leaves a considerable amount of moisture, and in some cases this amount is very great. This change of state from a fluid to a gaseous condition, is a cooling process, and the air near the surface, being secured from the sun and from the winds, becomes, by this means, so humid that a rank, succulent vegetation often springs up and thrives, which in an open field would wither and perish in an hour. The air being thus charged with moisture and cooled, does not take up by evaporation the rains which fall, and the soil, being more open, readily allows the water from melting snows and from showers to sink into the earth, from whence a portion appears in springs and in swamps, which give rise to rills and streams.

“ The air at all times holds more or less watery vapour in suspension, and its capacity for doing so is increased as the temperature is raised, not by a steadily gaining rate, but more rapidly as the heat is increased. There can be no evaporation when the air is saturated with moisture, and no deposit of water in any form until the temperature is reduced to the point of saturation. It is not yet determined as to how far the cooling and moistening influence of a grove may extend. It must depend upon many circumstances, and especially upon the slope of the surface and the direction of the winds. The effect is often apparent to the eye from the freshness of the herbage in adjacent fields for many rods in width.”

Woodlands and the Snow-fall.

“ The effect of woodlands in retaining snows where they fall, and in delaying their melting in the spring, has been everywhere observed in snowy countries. In such localities the snow cannot be drifted by the winds and when it melts it disappears slowly, sinking into the soil rather than flowing off upon the surface. The effect of this delay in checking a too-early appearance of fruit-blossoms, cannot be mistaken. The result is in fact quite similar to that of considerable areas of water, such as our northern lakes, along the borders of which and especially on the lee-side, fruits are found to flourish with the greatest success. In a country interspersed with clumps and belts of woodlands, the snows drift less and their melting more evenly over the surface cannot fail to be beneficial to the interests of agriculture, and more especially to meadows and pastures.” . . .

The Tree Pedlar.

There is one more point to which it may be well to call the attention of the intending tree cultivator, and that is the necessity of great care in the purchase

of trees. The tree-pedlar, while he has doubtless done much to stimulate both fruit tree and forest tree growing, has an almost proverbially evil reputation. He has, it is asserted, not only deceived his customers, but too frequently cheated his employers by taking orders in their name and executing them with inferior trees purchased elsewhere. Mr. Arnold remarked to the Commissioners:—

“I do not employ travellers to sell my trees. I have been very unfortunate with them, as they have been dishonest to me and the public too.”

Of the knavish tricks of some of these men others also spoke, notably Mr. Bucke, who had to tell of a highly recommended choice apple tree turning out a very excellent balsam poplar, or of an attempt, frustrated by the action of the witness, to pass off a well-known and very common variety of grape under a new and high sounding designation. It is idle to suppose that where there are rogues there will not be dupes or victims, but it may as well be understood, once for all, that only by satisfactory proof that the order is actually to be executed by some nurseryman of established reputation, of whom there are happily a large number, can the risk of imposition be avoided. The mere presentation of a card or trade list bearing a well-known name is not sufficient, for, if the card or list be genuine, the order may go elsewhere. It occurs to the Commissioners to suggest that every nurseryman should provide his travellers with forms of orders and envelopes with his address printed thereon, with a request to the customer added to mail the order himself at the nearest post office. This would ensure the execution of the order by the right man, and if people are so foolish as to buy without any such checks or guarantees they must take the consequences.

Concluding Remarks on Forestry.

The Commissioners during the progress of their investigations under this head, have been profoundly impressed, not less with the importance than with the magnitude of the subject. In fact, had the whole time devoted by them to the discharge of their varied duties been occupied in inquiring into the question of forestry in its many aspects, it might have been well spent. They feel that the evidence they have taken rather suggests further examination into, than exhausts the whole subject.

The arrangements and laws relating to forestry in Europe, as well as the progress of tree planting in the United States, in which direction an active movement has been going on for some years—would have been matters well worthy of close observation, and the Commissioners respectfully recommend that information thereupon should be obtained by such methods as may appear to the Government to be most convenient and effectual.

Possibly such information might assist in the solution of the question frequently raised in the course of this inquiry, By what means can tree planting by individuals or corporations be most successfully promoted?

Government assistance in the shape of money grants, exemptions of planted lands from municipal taxation, and the establishment by the Government of large forest tree nurseries have all in turn been suggested.

The Commissioners would be reluctant to advise the expenditure of any considerable sum of public money without having before them some scheme, the details of which had been carefully examined and worked out.

The subject is a new one to the minds of most of our people, and it is rather by the creation of public interest in the question, and a sense of personal responsibility with regard to it, that the ground work of any future plans must be laid.

Meantime the Commissioners are glad to be informed that the Fruit Growers' Association of Ontario, has included forestry and arboriculture in its programme of operations, and that the Government have given some encouragement to this step, while at the same time experimental tree planting has, under the auspices of the Association, been commenced at the Model Farm at Guelph. A few townships and urban municipalities have also offered inducements to the planting of streets and concession lines. All these are indications of a gradual awakening to a sense of the necessity of something effectual being done.

With the facilities that exist in all parts of Ontario, for obtaining a supply of materials close at hand, organizations in townships or school sections for planting a given number of trees, within a given period of time, and at the smallest possible cost, should not be difficult.

It has also been proposed that school-house lots, now usually presenting a most bare and uninviting appearance, should be planted with forest trees, and a small premium or reward be given to those schools, in a district, whose trees had been most successfully cultivated and best preserved for a given period.

It has further been suggested that interest might be excited, and information imparted, by lectures delivered by competent persons on forestry in connection, perhaps, with entomology and ornithology, so far as those topics affect the farmer and fruit grower.

Such lectures might be delivered in school-houses, under arrangements made by the county inspectors, the senior classes in the school, and the public generally, being invited to attend.

In treating of these subjects, however, pictorial illustrations would be indispensable, and a knowledge of the colours of leaves, insects, and birds would also have to be imparted. In order to accomplish this, and as the lectures would have to be delivered in the evening, the "magic lantern" might be brought into play, the novelty of such exhibitions assisting to ensure to the lecturer an audience.

The first cost of preparing transparencies would be considerable, but the other expenses of such a scheme need not be large, while the preparation for the work, of young men of ordinary ability and culture, would not be a difficult task, in view of the materials already at hand.

The objection raised to any proposal to add such studies to the already rather overcharged public school curriculum would be avoided, while parents, teachers, and children would, at one and the same time, be interested and instructed.

The Commissioners, in conclusion, may not travel beyond the bounds of their duty if they respectfully urge upon the Executive the propriety of steps being taken with regard to the preservation of the timber lands of the Province still in possession of the Crown, and not subject to the regulations affecting the pine timber forests.

Only by some action of this kind can waste and destruction be staid, and the stern necessity—which in other countries at this moment has to be faced—be avoided, of replacing, by slow methods and at enormous cost, what has been recklessly and unreflectingly destroyed.

CHAPTER V.

INSECTS, INJURIOUS AND BENEFICIAL.

The ravages of injurious insects upon field and fruit crops, and the part played by birds in relation to both crops and insects, were very frequently referred to by witnesses representing either the farming or fruit growing interests. But while much was said respecting the injury inflicted by insects, and a good deal both for and against the assumed usefulness of birds as insect destroyers, as well as much respecting the loss sustained by the attacks of the latter on the orchard and fruit garden, it was clear, that in many cases, the ideas of the speakers were exceedingly vague on all or any of these points, and that opinions had frequently been formed upon very inconclusive evidence.

Entomology and ornithology have, it is evident, made little progress as yet as popular studies in Canada, although it is gratifying to know that the Province possesses men who have applied their minds and intellects, with considerable success, to both subjects.

The evidence specially taken in connection therewith, and some extracts from testimony incidently received from time to time, will be found in Appendix E. Its main features will now be presented in as concise a form as possible, the insects injurious to grain crops and their parasitical enemies being first noticed

The insects referred to in the evidence as injurious to the wheat crop are:—The midge, the Hessian fly, the chinch bug, the grain aphid, the angoumois moth, the army worm, the wire worm, the spring-back beetle, and the daddy long-legs.

The insects mentioned as injurious to the potato are:—The Colorado beetle, the three-lined leaf beetle, the striped blister beetle, and the potato or tomato-worm.

The insects stated to be injurious to green crops are:—The locust, the red-legged grasshopper, the seventeen-year locust, and the thirteen-year locust.

The insects named as injurious to the hop plant are:—The hop aphid, the hop-vine snout moth, two butterflies—known respectively as *Grapta interragationis* and *Grapta comma*, a butterfly known as *Thecla humuli*, a moth known as *Plusia balluca*, and the Io Emperor moth.

The only insect specially mentioned as injurious to the pea is the pea weevil.

The list of insects injurious to the cabbage includes:—The cabbage butterfly, two native butterflies—the *Pieris casta* or *oleracea*, and *Pieris protodice*, the zebra-caterpillar, the cabbage plusia, the harlequin cabbage bug, and the cut-worm.

Insects Injurious to Grain and Grass Crops.

The midge, a European importation, according to the evidence of the Rev. C. J. S. Bethune, first made its appearance in Vermont in 1820, rapidly spread itself over the Eastern and Central States, occasioned in the State of New York, in 1854, a loss to the agriculturists of not less than \$9,000,000 by its ravages, appeared in Canada in 1856, in which year the injury it did to the crops was estimated roughly at \$2,500,000, and, in the year following, destroyed as was calculated, 8,000,000 bushels of wheat in the Province of Ontario alone. For ten or twelve years its unwelcome presence was more or less felt, but, since 1869, it has ceased to do any appreciable mischief, although in one or two instances, farmers examined by the Commissioners have referred to it as one cause of recent injuries to their wheat crops.

This tiny insect, in its several stages, is represented in the accompanying illustration, both magnified and of its natural size (*see Figs. 1, 2, 3, 4*). In appearance it resembles the Hessian fly in many respects. The chief distinction is in the colours of the body, the midge being yellow and the Hessian fly black.

Mr. Bethune thus describes its habits:—

“The midge frequents the ripening ears of the grain; the eggs are laid in the young and tender blossoms of the wheat, and as soon as the larvæ are hatched from the eggs they begin to feed upon the juices of the grain-kernel, and continue extracting the juices of the grain, causing it to shrivel up and become utterly worthless. When the period of the ripening of the grain arrives, the larva descends to the earth, and remains there throughout the winter. In the following spring it transforms into the pupa state, and in the month of June—earlier or later, according to the season—the perfect insect or fly makes its appearance, just about the time when the young crop of grain is beginning to assume the flower state. Its presence at this time of the year is made known to entomologists and others by large numbers flying in at the windows at night, covering the lamps, the papers on one's table, etc. It is in that way I have chiefly noticed the perfect insect.”

The serious loss sustained by the operations of this pest, led to many experiments with the view of arresting its depredations. It was chiefly fall wheat that suffered, the plant being, in the month of June—the time of the appearance of the midge in the fly and breeding stage of its existence,—just in a condition to suit its purposes. Efforts were made by Mr. Arnold, of Paris, and other hybridists to produce a wheat that should be midge proof. Mr. Arnold referred to these attempts in his late examination before the Commissioners. He said:—

“When I first began, the midge was very destructive, and there were certain varieties which were midge proof but of miserable quality, and my idea was to get our old Soule's wheat in midge proof chaff, which I believe, I accomplished; but, fortunately for the country, by the time my wheat was ready to introduce, the midge had disappeared everywhere, though I believe it has reappeared since in some localities.”

Other proposed remedies are thus referred to by Mr. Bethune :—

“One practical remedy that was recommended at the time was to burn all the screenings of affected wheat—all the refuse of the fanning-mill, the sweepings of the barn floor or any place where the grain had been stacked, and where the insects would naturally be shaken out. Another remedy was that in the fall the infested wheat fields should be very deeply ploughed, with the object of burying any insects that might remain, as far below the surface as possible, the advantage resulting from this mode being that, in the following year, they would not be influenced by the warmth so early as otherwise, their development would be retarded, and in all probability their appearance would be too late to be followed by any great injury. By these several methods they would, in fact, be starved out. . . . Besides these remedies another was proposed, viz., that spring wheat should be sown as late, and fall wheat as early, as possible; the object being that the former should be matured too late, and the latter too soon, for the attack of the midge in the month of June.”

In the opinion of Mr. Bethune the chief cause of the disappearance of the pest was due to parasites preying upon the midge, but so minute as to have escaped discovery. These friendly insects with others will be noticed later on.

The “Hessian Fly” (*see Fig. 5*) is now supposed to be an indigenous insect, the belief, from which it received its popular name, that it was introduced into the States by Hessian troops during the revolutionary war, being now dispelled. It is, however, a fact, that it was first noticed in the States in 1776. It was seen at Quebec in 1816, and in this Province in 1846, since which date it has been a frequent and unwelcome depredator upon the fall wheat crops, few years passing without notice of its presence being announced from some quarter. Its habits are described by Mr. Bethune as follows:—

“It appears first in the fall at the root of the fall wheat plant; its eggs are laid, and the larvæ hatched out below the surface of the earth on the root, and there they remain all winter, the brood appearing in the spring. There is a second brood in the spring which attacks the stalk, where the insect is most generally noticed. Farmers hardly ever observe the insect at the root, but every one who has observed it has seen it on the stalk.

“It attacks the stalk just above the first or second joint from the root, where it is enveloped by the leaves. The larvæ vary in colour at different periods of their existence, being very pale at first, but afterwards of a deep chestnut colour. Their first attack is made when the stalk is very tender and green, and they puncture it to extract the sap, the result being to cause a small depression where the larvæ remain. There may be five or six encircling a single stalk at one time, and the result of their combined efforts is to weaken and finally to break it, causing it to fall down, thus ruining the grain.

“After the larva has fed for a considerable time upon the stalk, it assumes what is called the ‘flax-seed’ state, resembling in colour, size, and general appearance, a grain of the ordinary flax seed. In that state it continues for a considerable period, and it is carried from the field to the granary while in this condition. It is a very much discussed point as to what this ‘flax-seed’ stage exactly is. It is looked upon as the pupa stage, but how it is produced—being so different from the form common among insects—has not been determined upon by entomologists, some thinking that the ‘flax-seed’ covering is the pupa stage,

and others that it is an exudation from the body. The Hessian fly attacks the stalk solely, never the ear."

Numerous parasites attack the Hessian fly, and to them is probably due, more than to any other cause, the curtailment of its ravages. As means to the same end, Mr. Bethune suggests the following artificial remedies:—

"The artificial remedies I would recommend would be the abandonment of fall wheat *pro tem.*, or to sow as late as practicable in the autumn, in order that the larvæ may not find the plant sufficiently advanced for their attacks at the roots before winter sets in. An additional remedy—if it may be so called—is to practice thorough cultivation, in order to make the plant as strong and healthy as possible, that it may the better withstand the attacks of the fly. I have not observed that the Hessian fly is attracted by moisture in the same manner as the midge. Its *habitat* in the summer is a very dry one, being under the close envelope of leaves which protect the stalk above the first or second joint."

The Chinch bug, although found in Canada, is scarcely known here as a destructive insect, although a great pest to the farmers of the Western States. The insects represented in the illustration (*see Fig. 6*) are largely magnified, the lines below indicating their natural size. It attacks various kinds of grain, is a persistent and incessant feeder throughout the whole of its existence and at every stage of its growth. Brood after brood appears, and no living article of vegetation is safe from their attacks. Wet weather is a check to its mischief, "a heavy thunder-storm," says Mr. Bethune, "being worth millions to the farmers of the Western States during the season of its ravages." It is, however, assailed by lady birds, lace-winged flies and *syrphus* flies, very effectively, and thus, to some extent, restrained in its depredations.

The Aphidæ, or plant lice (*see Figs. 7 and 8*), are a well known family of insects, and are found on a large number of plants. As a rule the Aphidæ are not very injurious to grain, but there are occasions when their propensities for mischief take that direction. Mr. Brodie, of Toronto, says in his evidence on that point:—

"Among the Hemiptera, the grain-aphis, the cabbage-aphis, the apple-aphis, and the oyster shell bark louse, have all done a great deal of injury. In 1863 the oat crop in North York was injured by the grain-aphis to such an extent, that the average weight of oats that season was only fifteen pounds per bushel and the yield per acre very small."

Of the habits of the Aphidæ, Mr. Bethune says:—

"In the early part of the summer, the Aphidæ may be found in great abundance, and they continue very numerous until towards the close of the season. It has been found, by close observation, that the females require only to be fertilized by the male once during a very large number of generations, that is to say, one impregnation by the male will last through the descendants of the original female for perhaps twenty-five or fifty generations. The males, consequently, are not required very frequently, and they make their appearance usually towards the close of the season. The males possess wings.

INJURIOUS INSECTS.

THE MIDGE, *Cecidomyia Triticæ*.



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.

Not more than one-tenth of an inch long. *Fig. 1* represents a highly magnified specimen with the wings expanded; the outline below shows its natural size. *Fig. 2*, the same, with closed wings. *Fig. 3*, the eggs. *Fig. 4*, the outline of the larvæ, highly magnified.

THE HESSIAN FLY, *Cecidomyia destructor*.



Fig. 5.

THE CHINCH BUG, *Micropus Leucopterus*.



Fig. 6.

Shows, on the left hand a specimen of the true chinch bug, on the right an ordinary bug, magnified.

THE APHIDÆ OR PLANT LICE.

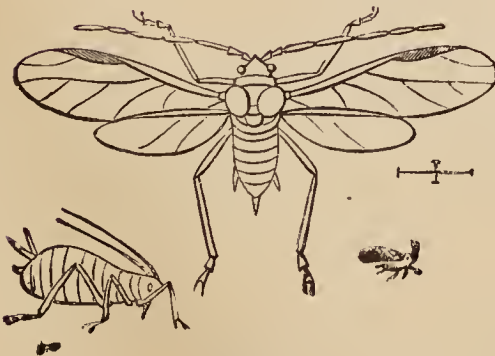


Fig. 7.



Fig. 8.

The above figures will serve to illustrate the insects belonging to this family. *Fig. 7* represents a highly magnified winged male and wingless female. *Fig. 8*, the wingless female very much enlarged.

"The excessive fertility of this insect may be imagined, when I mention that each female produces about four young ones a day, and these young ones are all females and able to produce offspring in like proportion when three days old, so that it has been calculated that, in twenty days, the progeny of one female—provided there were no disease or accident in the family—would amount to 2,000,000 individuals. If it were not for the various checks imposed upon them, in a very short space of time the whole habitable portion of the earth would be covered by these insects, and man would be quite driven off. There is probably no kind of vegetation that is exempt from their attacks.

"Some few of these insects pass the winter in hiding places out of doors. The impregnated females lay eggs in the autumn that survive the winter, and these hatch out in the spring. It is my opinion that these eggs all then hatch females, and the series of females continues until about the close of the season, when the males make their appearance.

"The insect's mode of life is the same from the time it is born until it dies,—it has, as a rule, its proboscis inserted into the plant on which it lives, pumping out its juices; in fact, it needs a constant supply of food to live, and if it were detached it would die. This does not, however, apply to the winged specimens; their object is to establish new colonies, and to perpetuate their kind.

"In feeding, this insect takes in such a large supply of liquid that it cannot assimilate it all, and is consequently obliged to part with some of it. This, dropping upon the surrounding leaves of the plant, is a sweet, sticky substance, called 'honey-dew,' and ants and other sweet-loving insects are excessively fond of it.

"Ants are so intelligent that they make a regular business of looking after the aphidæ, and getting them to part with their 'honey dew,' just as we obtain milk from a cow. They may be often seen pressing the body of the aphidæ at the hinder part of the abdomen, thus forcing the latter to part with little drops of 'honey-dew,' of which they immediately make use. Indeed, aphidæ used for this purpose have been known to be enclosed in a regular pasture, over which the ants kept watch to ward off intruders."

Happily not only such casualties as storms and climatic changes reduce the *aphidæ* in numbers, but they are also preyed upon by numerous parasites. Of these more will be said hereafter.

The Joint-worm (*see Fig. 9*) devotes itself chiefly to barley and rye, occasionally, however, directing its unwelcome attention to oats. Its last appearance, on a large scale, in this Province, was in the years 1866 and 1867. Mr. Bethune says of this insect:—

"Its eggs are laid in the month of June, and like those of the Hessian fly, are deposited about the first or second joint of the grain; the Hessian fly, indeed, having sometimes been mistaken for it. The effect of its work is to raise a gall or excrescence on the stock of the grain, close to the joint, somewhat resembling a joint—hence its name. The insect lives inside this swelling, where its larvæ work, while the Hessian fly lives in the depression of the outer surface. It attacks the stalk only, not the ear."

He adds:—

"The best artificial mode of combatting this insect is either to burn the stubble of the infested grain, cutting high, so as to leave the first and second joints standing, or to cut very close and to burn the straw afterwards. These, however, are dangerous remedies, on account of the risk incurred by the use of fire."

The Angumois moth (*Butalis cerealella*), with its caterpillar, has been seldom seen, to any injurious extent, for a long period.

The Army worm (*Leucania unipuncta*)—see *Figs. 10 and 11*—has a terrible reputation and is more common than many suppose, not often in such force as to produce very disastrous results, although it is sufficiently destructive. Mr. Bethune says of it:—

“This insect, so far as its habits are thoroughly known, feeds chiefly upon wild grasses of all kinds, and upon the grass of moist meadows and marshes, at times being excessively abundant. So abundant does it sometimes become in its own locality that, like the chinch bug and the locust of the west, and many other insects, it sets out to find fresh supplies. In order to do this, the insects assemble in very large numbers, and they all seem to go with one accord in a certain direction, as if they were a regularly marshalled army, hence the name ‘army worm.’ Of course the stories about their being told off in battalions, etc., are purely mythical. Generally speaking, they do not turn aside for any obstacle; if they come to a fence or a barn, they try to go over it instead of around it. They will stream across roads, and the railway tracks in Long Island, and lately in New Brunswick, have been covered to such an extent as to prevent the movement of the trains, the driving wheels of the locomotive being so greased that they could not bite on the rail, and sand or earth had to be thrown on the rails to enable them to do so.”

If the Army worm has up to the present time done no very serious injury to the crops in Ontario it still must be regarded as an ever-present and possible danger. Mr. Bethune says on this point:—

“We in Ontario have never been visited by such numbers, but we have had them to a certain extent and they are very destructive. When they appear in numbers the best method of meeting them would be to plough a deep furrow, or dig a trench, in the front of their line of march, with a steep side in the direction in which they are going, and when they are trying to get out of it, to throw straw or shavings or something of the kind and set fire to it, or otherwise to bury them with earth. It is an insect to which we are liable at any time, and any sort of vegetation, whether grain crops or anything else, is food for it. It is a very common insect, and I suppose all our gardens have a few specimens at all times, but it does not propagate very rapidly in our climate, though if the checks upon it were removed, it would increase enormously in numbers.”

Poultry, wild birds of some species, and several parasites and friendly insects keep it in check.

“The wire worm (*Agriotes mancus*),” says Mr. Bethune, “is sometimes troublesome to wheat. This insect lives altogether out of sight, under ground, and hence it is not much observed by the farmer. It is a long slender grub, with six legs under the anterior portion of the body, usually of an orange yellow or tawny colour, and is very hard, unlike our caterpillars, which are soft to the touch, consequently receiving its name, the ‘wire worm.’ It feeds under ground upon the roots of vegetation, and is looked upon in England as one of the very worst foes of wheat. In Ontario, we have not been able to estimate its ravages as resulting in any great loss, though this may be because they are carried on out of sight. It is frequently observed in ploughing.”

INJURIOUS INSECTS.

THE JOINT WORM—*Isosoma hordei*.

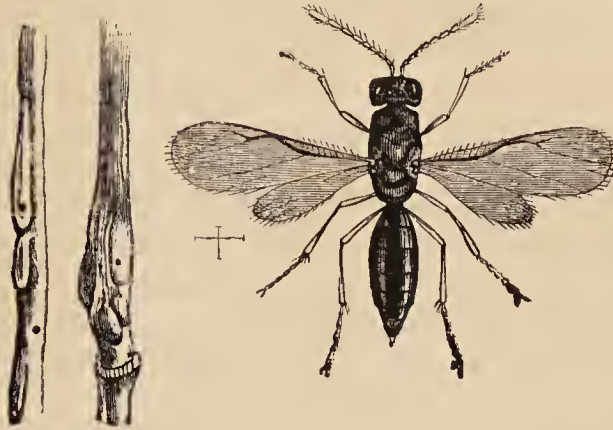


Fig. 9.

THE ARMY WORM—*Leucania unipuncta*.



Fig. 10.



Fig. 11.

Of which *Fig. 10* shows the caterpillar, and *Fig. 11* the moth.

THE RED-LEGGED GRASSHOPPER—*Caloptenus femur-rubrum*.



Fig. 12.

The wire worm, however, does not cease to be troublesome when it quits its larval state, and appears in the shape of the spring-back beetle.

"The perfect creature," says Mr. Bethune, "is very familiar; it flies into the house at night, attracted by the light, and may be found creeping about sap exuding from trees, ripe fruit, or anything sweet."

He recommends employing children to follow the plough and pick up the wire worm, or to turn turkeys and ducks into the ploughed fields, as remedies for the too great numbers of this creature.

The larva of another very familiar insect, popularly known as daddy long-legs (*Tipula*), is more injurious to timothy and ordinary grasses than to grain.

"Its larva," says Mr. Bethune, "is a grayish, dirty-coloured caterpillar that feeds upon grain, and vegetation of a similar kind. It has the faculty of surviving intense cold. Some years ago specimens were sent me that were gathered at the close of the winter in a field near Cobourg; they seemed to be perfectly hard frozen, and apparently as brittle as little sticks, but on the application of warmth, they became quite lively and prepared to feed. It attacks the roots of the plant, and meadows and lawns are often seriously injured by its ravages."

The Province of Ontario has never been afflicted by a visitation from the Rocky Mountain locusts (*Caloptenus spretus*), although, in other parts of the Dominion, that calamity has been experienced. The history of this pest and its migrations is interesting, but as, for reasons given in the evidence, there appears to be no reason to dread it in this Province, it will be sufficient briefly to notice Mr. Bethune's description of its habits. He says:—

"The life history of this insect in a few words is as follows:—They are hatched out in the plains in countless numbers, eat up everything before them, and consequently become destitute; instinct compels them to move on, just as in the case of the army worm, and being winged insects, they fly up into the air to a considerable height, and are then borne along by the wind, alighting when they reach a country covered with vegetation.

"Not being able to fly against the wind, their flight during the latter part of summer has been found to be invariably from the north and north-west towards the east, this being the direction of the then prevailing winds. They then deposit their eggs, from which are hatched out next spring, new insects. In the spring the prevailing winds are in an opposite direction, and the new insects, having obtained their wings, are carried back towards their original haunts, whence, in turn, fresh hordes are borne to the east.

"They have never come much east of the Missouri River, and I think the Mississippi will be found to be their extreme limit eastward. This was the conclusion Professor Riley came to, so that we need never fear them in Ontario. The insect devours in all its stages."

We have, however, often a very disagreeable experience of the presence of the near relative of the locust, the red-legged grasshopper (*Caloptenus femur-*

rubrum), its powers for mischief being limited, and only limited, by its incapacity for flying more than a few yards at a time. As a matter of fact this insect is a locust and not a grasshopper at all. (*See Fig. 12.*)

"The grasshopper, properly so-called," says Mr. Bethune, "is a grayish-green insect that feeds upon grass and foliage, and is never sufficiently numerous to do much damage."

Mr. Brodie, in his evidence, refers to the great injury done by these insects to crops in the County of York some twenty or twenty-five years ago. Since that date the loss sustained by them in that district has been considerable. They were, some seven or eight years ago, so numerous in some parts of Muskoka as to inflict much suffering and inconvenience on new settlers, and the evidence taken by the Commissioners in that district shows they are still in places exceedingly troublesome. In the County of Lanark they have more recently done much mischief. Mr. James Donald, in his evidence, says on this point:—

"In our district the grasshoppers attacked the crops severely about four or five years ago. They had been numerous the year before, but did not hurt the grain crops. Four years ago they ate up everything but peas. They even ate the corn in the ear and the potato vines. The next year they were as bad. That induced people to raise rye, which got ahead of their ravages.

"The wet season at harvest time in the next year diminished them. Since then they have continued to decrease in numbers. They still do harm in the pastures. The years they were most troublesome were very dry years. The plentiful supply of grass crops is always a protection to the grain against their attacks.

"Of 24 acres of hay that should have given $1\frac{1}{2}$ tons to the acre I did not get a load; and of 11 acres of oats I had none to thresh out. This was in the worst year—I think 1877. The spring wheat was also destroyed. Their ravages extended over the whole country, less or more, except in some of the good farm lands."

Other witnesses from that section of country fully confirm Mr. Donald's description. The grasshopper's favourite breeding grounds are old pasture lands and meadows with a light dry soil. To the parasitical enemies of this insect we have to look almost exclusively for its destruction.

The Cicada, often spoken of as a locust, "known by the peculiar shrill whizzing sound which it makes in the trees during the heat of the day," is hardly to be termed destructive in its habits. The seventeen-year and thirteen-year locusts of the United States are members of the Cicada family. The seventeen-year locust is represented in the accompanying illustrations. (*See Fig. 13.*)

INJURIOUS INSECTS.

THE SEVENTEEN-YEAR LOCUST.

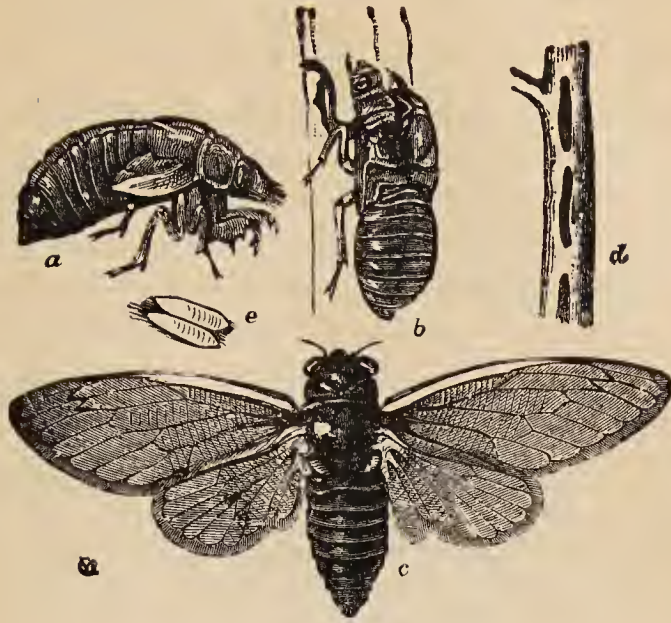


Fig. 13.

Fig. 13 represents different stages in the life-history of the 17-year locust. (a) is the pupa; (b) the empty pupa-case after the perfect insect has emerged from it; (c) the perfect or winged insect; (d) the perforations in a twig for the deposit of eggs; (e) the egg.

THE COLORADO BEETLE—*Doryphora decemlineata*.



Fig. 14.

Shows the Colorado Beetle in its various stages of development.

THREE-LINED LEAF BEETLE—*Lema Trilineata*.

THE STRIPED BLISTER BEETLE—*Epicauta vittata*.



Fig. 15.

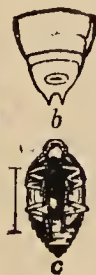


Fig. 16.



Fig. 17.

Fig. 15 represents the larvæ of this insect; and Fig. 16, the beetle.

Insects Injurious to the Potato.

Some notice of the insects injurious to the potato come next in order. First of these is the too well-known Colorado beetle, of which an illustration in its various stages of development is given. (*See Fig. 14.*) Having its home originally in the Rocky Mountains, it travelled eastward as it found itself within reach of the cultivated potato plant of which it is so greedy a consumer. Mr. Bethune thus describes its arrival in Canada. He says:—

“It kept moving eastward, still increasing in numbers, until it covered the whole of the States west of us. In 1871 I found it very abundant at Chicago, and on the shores of Lake Michigan; it was then unknown in Canada. I wrote some articles in the daily and weekly *Globe*, and *Canada Farmer*, calling attention to the insect, and warning the people of this country of the invasion which was about to take place, and proposing that some measures should be taken by the Legislature to ward it off, if such a thing were practicable. Nothing, however, was done, and the following year the insect made its appearance, crossing the River St. Clair.

“We supposed that it would have gradually come eastward, but, to our surprise, it took advantage of the railways and canals, and spread itself with great rapidity, even to the remote parts of the Province. Having once arrived in this country, there was no possible means of repelling the invasion, and the only plan was to keep it under as far as possible.”

At first its appearance created a feeling of some dismay, and a want of acquaintance with any effective means of destroying the pest occasioned serious loss to the potato crop. But public attention having been fully aroused, action was taken, and now the potato bug, as it is called, is not the cause of very much alarm. Mr. Bethune says with regard to its suppression:—

“As the result partly of the experiments of Professor Riley, and partly of those of Mr. Saunders and Mr. Reed, who were appointed a committee by the Department of Agriculture, Paris green was found to be the most effective remedy. The information being communicated to the public by the Department of Agriculture and the newspapers, our farmers at once became informed of the best mode of attacking the insect, and ever since, it has been kept in fair check. At first the crop of potatoes was short, and the price raised, but, since the first two or three years, it has not been looked upon as a very serious pest, simply because everybody is on the *qui-vive* against it. I am certain, however, that if the community were to relax their efforts, it would soon eat up all our potatoes. There is no doubt that it is now a permanent resident of the country, and that we shall never be entirely free from it.

“It lives upon all the members of the solanaceous family; it will occasionally attack the tomato; it is very fond of the egg-plant, and of the wild members of the family, such as the bitter-sweet and the deadly nightshade.

“It is a disputed point whether Paris green prejudicially affects the potato plant, but there is no evidence, so far as I know, that it does. It is a question whether, if used year after year on the same piece of ground, it would not affect the soil somewhat. I think our farmers are not sufficiently careful in handling it. It is excessively poisonous, and there are every year a number of cases of poisoning arising from its use, which ordinary care would be sufficient to guard against.

"There are a number of insect parasites which attack the Colorado beetle, but, of course, the application of Paris green kills these as well as the beetles. If the potato were not grown to such an enormous extent, these parasites would keep the beetle down to the dimensions of an ordinary plague, without artificial remedies."

London purple is another remedy very similar in its effects to Paris green. In using these powerful poisons where potatoes are grown in large quantities, the best way, says Mr. Bethune, "is to apply the poison dry, mixed with lime, ashes or earth, but wherever there is a danger of its being blown on other vegetables, the better way is to mingle it with water and apply it with a whisk. It can be done just as rapidly in this as in any other way."

The careful and persevering daily destruction of the eggs, a work in which children can be very well employed, is usually the means of greatly reducing the numbers of this pest.

The three-lined leaf beetle (*Lema trilineata*)—see Figs. 15 and 16—and the striped blister beetle (*Epicauta vittata*)—see Fig. 17—are also enemies of the potato, and may be destroyed, if they become damagingly numerous, by the use of Paris green.

The potato or tomato worm, feeding on both these plants, although preferring the latter, is thus described by Mr. Bethune:—

"When disturbed, it raises its head in a very threatening manner, and altogether looks so ferocious that it is popularly supposed to be very poisonous, which, however, is not the case, its bite being so feeble as not even to penetrate the tender skin of one's hand or arm. When connected with the *Canada Farmer*, I looked into a number of cases in which the bite or sting of the insect was alleged to have caused poisoning, and found every one of them utterly unfounded, and came to the conclusion that the stories had been caused either by the juices of the tomato plant getting into an open wound, or by the sting of a wasp sometimes found amongst these plants. This worm has been ascertained to be identical with the tobacco-worm, which is so great a pest in the Southern States."

The Sphinx moth (*Sphinx quinque-maculata*) is the mature insect of the tomato worm. The Sphinx is described as living through the winter in its chrysalis state; the moth, a handsome creature, derives its name from five orange spots on each side of its body. (See Fig. 18.)

Insects Injurious to the Hop Plant.

The hop aphid (*Aphis humuli*) living on the juices of the plant, attacking the tender foliage and twigs, and blighting and withering up the plant, is thus referred to by Mr. Bethune:—

"In England the growth of the hop is almost dependent, from year to year, upon the appearance or absence of the 'fly,' or aphid, known as *Aphis*

INJURIOUS INSECTS.

THE SPHINX QUINQUE-MACULATA.

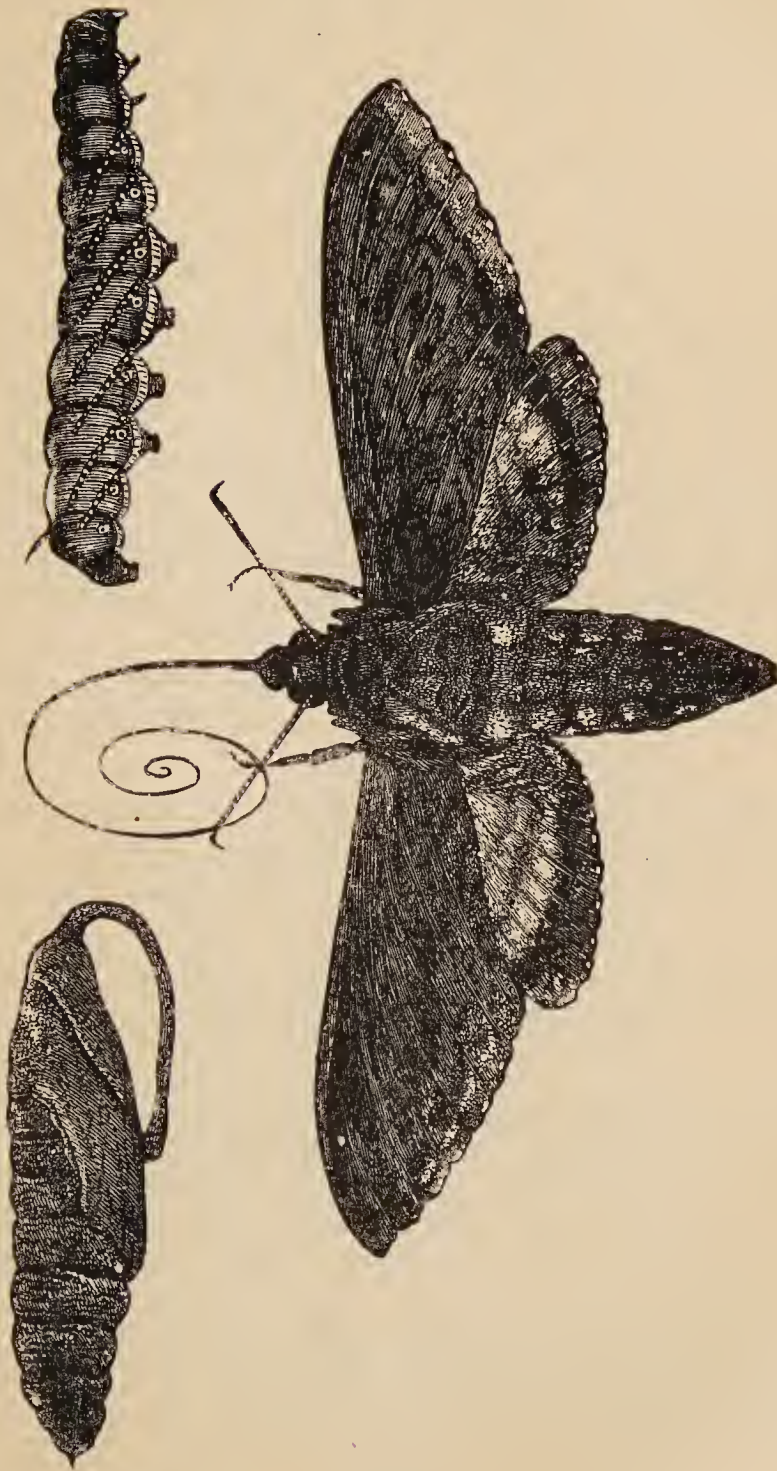


Fig. 18.

Fig. 18 shows the larva partly grown, the perfect moth, and the chrysalis.

humuli, though, in this country, we are not troubled by it to the same extent. It is not necessary to give an account of the life-history of this insect, as that given of the grain aphid, will also apply to this variety. It has probably come to this country from England, though the hop is an indigenous plant here, as I have observed it growing on the Kaministiquia River, where it is not at all probable it had been planted, and it is also found growing wild in many parts of the North-West. It is, therefore, not impossible that the insect may have existed here before its introduction from England."

It is to parasites we are indebted for a defence against this pest.

The hop-vine snout moth (*Hypena humuli*) is described as follows:—

"There is another insect very destructive to the hop, viz., the hop-vine snout moth, or *Hypena humuli*. Hops were, and are, grown in the County of Peel to a considerable extent, and while living there, I found this insect very abundant indeed.

"Occurring in large numbers, it destroys the foliage of the plants, and so injures them that sometimes no hops fit for market are produced. It is a pale green worm, which appears in June, the moth appearing in July to lay its eggs, and another brood appearing later on, so that there are two broods in the year. When disturbed it lets itself down by a silken thread a short distance, and if let alone, climbs up again."

Strong tobacco water, lime dusted on the plant, and hellebore, are useful remedies against this insect.

Some cut-worms, and a caterpillar very much resembling the cut-worm in appearance, but not very precisely identified by the witnesses, are also found among the hop's assailants.

Two butterflies (*Grapta interrogationis* and *Grapta comma*) also feed on the hop, and are occasionally so numerous as to be a nuisance. They are described as—

"Of a reddish colour on the upper surface of the wings, and dull on the under surface, with some silvery markings in the form of a semicolon (the Greek mark of interrogation), or a comma, according to the variety."

Their parasites will be noticed with others in due course.

A small butterfly, and its caterpillar (*Thecla humuli*), and a moth (*Plusia balluca*) with wings of "a very brilliant metallic green colour," and of which an illustration is also given (see Fig. 19), feed on the hop, but not to a damaging extent.

The Io Emperor moth (*Hyperchiria varia*) and its caterpillar, are also illustrated, the male moth being the smaller and the female the larger insect. (See Figs. 20, 21 and 22.) The insect remains in its chrysalis state during the winter

and the moth appears in the spring. They are not so numerous as to be destructive. The caterpillar has a curious faculty, which is thus described by Mr. Bethune. He says :—

“The caterpillar has won some distinction over our other caterpillars by being possessed of a stinging property. It is covered with bands of bristles, and when they pierce the tender skin of the body they produce an irritation similar to that caused by nettles. It grows to a considerable size, and when coiled up, somewhat resembles the burr of a chestnut. It has a rich reddish-coloured stripe extending on each side of the body throughout nearly the entire length, rendering it, in combination with the yellow spine-rings, a remarkable insect, and one that can be easily identified. It feeds upon a very large variety of trees, shrubs and plants, amongst others, upon the hop.”

Insects Injurious to the Pea.

The pea weevil (*Bruchus pisi*) is a comparatively recent importation, and at the present time a source of great loss and injury to the agriculturist. It has not only rendered the pea crop nearly valueless to the home consumer, but it has well nigh destroyed a profitable trade in seed peas carried on with the States. (See Fig. 23.) The following description is given of the pea bug by Mr. Bethune :—

“It is a very remarkable creature in its habits. The parent insect is a little beetle, which deposits its eggs in the blossom of the pea, just before the petals fall. The egg hatches out a little worm which penetrates down inside of the growing pod, fastens upon and enters the young pea. The hole which it makes when entering the pea is completely filled up by the subsequent growth, consequently when the pea is ripened the insect is found inside without any visible aperture at all, and the wonder to the ordinary observer is, how the creature ever got there. The pea develops in the ordinary way, and seems to grow as large as usual, but, of course, is very deficient in weight. The insect does not eat away the whole interior of the pea, but simply a hole in it, in which it goes through all its transformations. When it arrives at the stage of the perfect beetle, it gnaws its way through, flies away, and appears again to lay the eggs for the next crop of insects. I have no doubt these insects are eaten very often in peas which are brought to the table, but having fed upon nothing but the pea, they have no taste and do harm to nobody.”

Numerous references have been made to this pest in the course of the inquiry. Mr. Brodie says of it :—

“The pea weevil is rapidly moving northward and westward. In the vicinity of Toronto, in favourable seasons, there are two broods. From close personal observation, I am quite sure of this. I have been assured by careful observers that there are two broods in the townships south of London, so that the expedient of early or late sowing is of little avail. So rapidly is this insect increasing in the county of York that unless some remedy is applied, farmers will have to give up the cultivation of peas.”

Mr. Hobson, of the County of Wellington, says :—

“We have not grown many peas lately, on account of the pea bug. There is a bug to each pea. The only remedy I know of for this pest is to stop growing

INJURIOUS INSECTS.

PLUSIA BALLUCA.



Fig. 19.

THE IO EMPEROR MOTH AND CATERPILLAR—*Hyperchiria varia*.



Fig. 20.



Fig. 21.



Fig. 22.

peas altogether for two or three years. I was told by Mr. Renton that it was very bad in Wentworth about twenty years ago, and that the farmers generally gave up growing it for two years, and the result was that the bug was destroyed. I don't think there is any other remedy."

Mr. Drury on the other hand, from the neighbourhood of Barrie, County of Simcoe, "had never seen a pea bug in the district."

Mr. Dickson of Tuckersmith (Huron), says:—

"The pea bug seemed to begin its ravages in the southern counties, and it is gradually working north. I have no doubt they will get a taste of it in Simcoe by and by. Last year the pea crop completely failed with me, and this year I have not sown a bushel, in the hope that the pest may die out. . . . The farmers in my district have ceased growing peas almost altogether. I used to get 50 per cent. more for black-eyed Marrowfat peas than for any others. Before the pea bug came I raised thirty bushels to the acre. Latterly the bug became so bad that there was scarcely a pea that had not a bug in it."

In June last the bug had not made its appearance in Lanark when Mr. Matheson, of Perth, was examined, at Toronto, nor had it arrived when the Commissioners visited that district in October last.

But in Kent the consequences of its attacks have been very disastrous. Mr. S. White, of Charing Cross, Kent, says:—

"Peas have gone out of cultivation because of the bug. A few are still sown, but I think the Legislature should prohibit their growth until the bug is killed out. They used to grow well in this county. I think the blue pea is as little liable to the bug as any. The only plan we had of avoiding the bug was to sow very late, and we sowed later and later every year, but now we cannot secure a crop even by that means. I think it is nearly twenty years since the pea bug made its appearance. Before that the pea crops were both large and profitable. We used to sow wheat after peas, and it was a crop that answered well for that purpose.

"I don't think any decisive steps were taken at first to prevent the ravages of the bug. Some are growing peas yet, and of course that is sufficient to keep the pest in existence. There has been no concurrent effort made to take action in the matter; the Agricultural Societies have done nothing in particular to get rid of the insect. There is no hope of getting rid of it, in my opinion, until the people are compelled to quit sowing peas. I don't know of any who are raising peas successfully. I think I have heard of its being got rid of in other counties by concurrent action in the manner suggested. Some continue to sow peas for the purpose of feeding them green. I know of no section of the county where the growing of peas has ceased."

Mr. Iler, from Colchester, Essex, says:—

"Very few peas are grown, owing to the prevalence of the pea bug. We have been troubled with it for a long time. On heavy soils peas are also liable to mildew. I think a large portion of our soil is too rich for peas, as they grow to vines too much, but in other portions of the county we could raise them profitably but for the bugs.

"The bug is worse than it used to be, I think, and is increasing year by year. The only means adopted to get rid of the bugs is to cease growing peas, and that means has been pretty generally adopted. I think that is the only way of getting rid of them. The bug is troublesome all over the county. I don't know that there has been any co-operation for the purpose of killing the bugs. In our

neighbourhood we have ceased growing peas by general consent, but I don't know how it is in other parts of the county."

Mr. Ketcham Graham, of Sidney, County of Hastings, says:—

"The pea bug is getting to be a serious pest. The only plan we take to avoid it is to get our seed from the northern townships, where it is not so prevalent."

Mr. H. Middleton, of Clark, Durham, says:—

"I have heard of no complaint of the pea bugs this season, though they were common in the front of the township last year. Peas are a very profitable crop, producing from 20 to 40 bushels to the acre."

Mr. Smellie, of Vaughan, County of York, says on the same subject:—

"Peas used to do very well with us until the last two years, and since then the bug has almost destroyed the crops. Some people this year sowed their peas very late, after everything else was in, to see how it would work. I sowed mine very late, but the bug was just as bad as if I had sown it earlier."

In the neighbourhood of Owen Sound the pea bug has not yet arrived. The growth of peas in that section is very large, and the crop, usually, a heavy one. Most persons will therefore sympathize with Mr. Cochrane, of Kilsyth, when he says:—

"The pea bug ought to be looked after. Our section of country largely depends on its pea crop."

Replies to questions from other parts of the Province all go to show that the pea bug's ravages have been extensive, that the pest is still advancing, and that no section is perfectly safe from its presence. It does not appear that the pea bug is subject to any parasitical attacks, so we are left to devise what artificial means we may for its extermination.

Mr. Bethune suggests some remedies, of which one is the following:—

"One remedy, which I have seen practised to avert it, is to keep the seed peas, if they are observed to be infested at all, over the year in tight vessels. The peas, for instance, are gathered this year, and next year the beetle would mature and come out of them, and being unable to escape from the vessel it would die. There would be no place to lay its eggs, or, if any eggs were laid, they would be valueless. If these peas were sown the following year, many of them would probably die, but a very large proportion would retain their vitality and germinate, and the ensuing crop would be entirely free from the bug."

This is obviously only a partial remedy, and its complete success depends upon the chance that the bug has left the pea in a vital and germinating condition. But it is probably a safer measure than the next suggestion, which is as follows:—

"Another remedy is to pour water which has been heated almost to the boiling point over the peas, a few seconds exposure to the water sufficing to kill the insect, but not the vital part of the plant. This method of treatment, however, would have to be carried out with a great deal of care. I have noticed that

INJURIOUS INSECTS.

THE PEA WEEVIL, OR PEA BUG—*Bruchus Pisi*.



Fig. 23.

THE CABBAGE BUTTERFLY—*Pieris rapæ*.



Fig. 24.



Fig. 25.



Fig. 26.

Fig. 24 shows the male ; *Fig. 25* the female ; and *Fig. 26 (a)* the larva, and *(b)* the chrysalis.

a very large number of the infested peas will float on the water, while the uninfested ones will sink to the bottom, during a brief immersion. The sound peas might in this way be roughly separated from the unsound, but it would not be a complete mode of separation, as in many cases only those in which the greater portion of the interior had been eaten out would float.

It is, however, stated that by placing the peas in a warm room the insects will be prematurely hatched into life, come forth from their holes in the peas, and, finding no means of sustaining life, will die, the peas being then used as seed without danger of propagating the pest.

As is very usual in face of obvious danger, there is a call for legislation to avert the calamitous consequences the total destruction of the pea crop would entail. In Kent the bug has been known for twenty years, probably gathering in numbers all the time, and yet there does not seem to have been any concerted action, any deliberation, or effort, to provide remedies. Mr. White says:—

“There is no hope of getting rid of it, in my opinion, until the people are compelled to quit sowing peas.”

Mr. Cochrane, from Grey, says:—

“It would be a great boon to those sections of Ontario where the bug has not yet become generally known, if the Legislature would pass an Act to give Township Councils the power to pass by-laws to prevent, as far as possible the spread of the pea bug. I think the measure would have to be to the effect that a person would be liable to a heavy penalty if he were convicted of sowing peas which he knew to be infected with the bug. To carry out such a measure I suppose it would be necessary to have inspectors. I think, however, if the attention of people were drawn to the evil they would be more careful. I don't think the persons who sowed them in our neighbourhood would have done so had they known the bug was such a terrible enemy. As far as the Township Council of Derby is concerned, I have not the slightest hesitation in saying that, if it were in their power, they would pass a by-law to prevent the sowing of peas infected with the bug.”

As already noticed, it was mentioned by one of the witnesses that the County of Wentworth was cleared of the pest, some twenty years ago, by the farmers for a couple of years ceasing to grow peas. If, either by voluntary effort or compulsory measures, this could be done in every infested district, the result could not fail to be beneficial. But the danger would be in a re-importation of the bugs when pea growing was resumed. Temporary abstinence from sowing would have to be coupled with stringent safeguards against the re-introduction of infested seed, or the first effort would be in vain. It is stated by Mr. Saunders in his report on Manitoulin, that the pea crop there is quite free from the bug, and that infested peas have been sown in that region without the bug making its appearance. It is gratifying to know that the usually healthy atmosphere of Manitoulin is unfavourable to the pea bug, but it would obviously be unwise to presume on its non-acclimatization. Meantime, however, it is suggested that the Island may afford a welcome supply of non-infested seed.

Insects Injurious to the Cabbage.

The Cabbage Butterfly (*Pieris rapæ*) was first seen in Quebec in 1859. (See Figs. 24, 25 and 26.) It is supposed to have taken passage in an Allan steamer, and now is found over a large portion of the Dominion and United States. In numbers it is very destructive to the cabbage plant and it is exceedingly prolific. On this point Mr. Bethune remarks:—

“There is, unfortunately, a constant succession of broods; we find the larvæ and butterflies in all stages, from early in the season until late in autumn; in fact, the butterflies are at this moment engaged in laying their eggs. Their ravages, happily, are not at their maximum during the early stages of the plant, and a good deal may be done by destroying the insects at this time.”

Hellebore and other poisons are hardly eligible in connection with the cabbage plant, however effective in killing the caterpillars. Hot water or brine at a temperature sufficient to kill the caterpillars but not injure the cabbages is suggested. But here, again, we have most to depend on a friendly little parasite to whose performances reference will be made presently. *Pieris rapæ* has relatives on this side of the Atlantic, in two native butterflies (*Pieris casta* or *oleracea* and *Pieris protodice*), but they are rare and practically innocuous.

The Zebra Caterpillar (*Mamestra picta*) also attacks the cabbage. It is not very common here. The caterpillar and its moth, one of the night-flying species, are shown with other illustrations. (See Fig. 27.)

The Cabbage Plusia (*Plusia brassicæ*) turns into a moth and feeds freely on the cabbage and cauliflower. The remedies fatal to the cabbage butterfly would also destroy the above-mentioned cabbage plant enemies. (See Fig. 28.)

Of the Cut-worm (See Fig. 29) which attacks the cabbage, Mr. Bethune says:—

“The cabbage plant, in its young stages, is very liable to the attacks of cut-worms. Every gardener is familiar with the annoyance, after he has set his plants out, of finding them in the morning cut down and dead.

“This is the work of a caterpillar that hides under rubbish in the day time, and comes out only at night. It divides the stem of the cabbage, pulls down the foliage, and feeds upon it during the night.”

For this pest Mr. Bethune suggests the following remedies. He says:—

“One remedy is to dig around the plants that have been cut, bring up the insect and kill it. Another of the best remedies is to wrap a piece of stout paper around the stem of the plant when setting it out; place it a short distance below the surface of the ground, and a short distance above, so as not to interfere with either the root or leaves of the plant, and it will be found a pretty good protection against the cut-worm. Sometimes soot is put about the stem just on the surface of the ground, sometimes ashes, and sometimes salt. If the paper is used it will

INJURIOUS INSECTS.

THE ZEBRA CATERPILLAR—*Mamestra picta*.



Fig. 27.

THE CABBAGE PLUSIA—*Plusia brassicæ*.

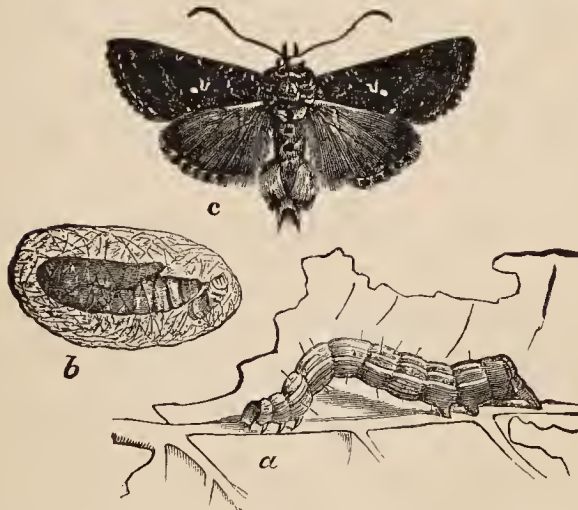


Fig. 28.

THE CUT-WORM—*Agrotis messoria*.



Fig. 29.

Fig. 29 shows the larva and moth of the dark-sided cut-worm (*Agrotis messoria*), one of our commonest species.

THE HARLEQUIN CABBAGE BUG—*Strachia histrionica*.



Fig. 30.

be found that by the time it becomes soft and useless, the plant is beyond the stage at which the worm is harmful. These cut-worms attack vegetation of all kinds and are especially troublesome to young plants."

The Harlequin Cabbage Bug (*Strachia Histrionica*)—see *Fig. 30*—while a great annoyance to gardeners in the States, is little known in Ontario.

Insects Injurious to Fruit.

The insects injurious to fruit will be next noticed. They are as follows:—Insects attacking the apple—the root plant louse, the striped borer, the Buprestis borer, the oyster-shell bark louse, the apple-tree plant louse, the tent caterpillar and forest tent caterpillar, the tussock moth, the yellow-necked caterpillar, the red-humped caterpillar, the fall web-worm, the canker-worm, the *Cecropia* emperor caterpillar, the rascal leaf-crumpler, and the codling worm. The pear-tree slug is the only insect referred to as especially infesting the pear tree.

The insects injurious to the plum are, the plum sphinx, the *Polyphemus* caterpillar, the eye-spotted bud-moth, the oblique-banded leaf-roller, and the *curculio*.

The peach borer is the only one mentioned as selecting the peach for its attacks.

The insects named as injurious to the currant and gooseberry are the imported saw-fly, the native saw-fly, the currant geometer, the spinous currant caterpillar, the four-striped plant bug, the gooseberry fruit worm, the imported currant borer, and the American currant borer.

Those attacking the raspberry are, the raspberry cane borer, and a small geometer (*Aplodes rubivora*).

Insects referred to as injurious to the strawberry are, the crown borer, the white grub, and the strawberry false worm.

Insects Injurious to the Apple.

The root plant louse (see *Fig. 31*) affects the apple tree by laying its eggs on the roots, the young lice hatch, and their punctures produce irritation and cause the formation of galls, as shown in the illustration. The tree becomes unhealthy in consequence. The only artificial remedy suggested, is to uncover the roots and pour boiling water upon them, but this is clearly not a convenient operation, especially where the trees affected are numerous. A parasite is here our best friend.

The borers assail the trunk of the tree. The striped variety (*see Fig. 32*) is scarce, but the *Buprestis* is only too common. (*See Fig. 33.*) It is described by Mr. Saunders as follows:—

“The other borer, the *Buprestis*, is unfortunately very abundant throughout the Province. The one species may be distinguished from the other by the difference in form, both in the larval and perfect state. The *Buprestis* beetle is much smaller than the other, and of that coppery metallic hue which Mr. Bethune has described as peculiar to the family of *Buprestidæ*. The larva of the striped borer is nearly cylindrical, with a large brown head and strong jaws, while that of the *Buprestis* resembles a tadpole in form, the anterior segments of the body being much enlarged, and the hinder ones correspondingly small. The habits of the two species are very similar. The parent insects deposit their eggs on the bark of the tree, the striped borer generally about the collar, or base of the trunk, and the *Buprestis* sometimes there, but sometimes higher up on the trunk, or even above the first branches. The eggs are soon hatched, and the young larvæ bore in as far as the sapwood, and live there until they grow large enough and strong enough to bore into the harder wood of the trunk.”

As a remedy for this pest Mr. Saunders suggests the following:—

“Their presence may be detected by the smooth, somewhat shrivelled appearance of the bark of the tree over the spot where they are at work, or by the castings of the wood which the larva throws out as it increases in size. If, on thrusting the point of a knife into the collar or base of the tree, a cavity is found, that fact will indicate the presence of a larva, which should at once be searched out and destroyed. Another remedy, a preventive measure, is the application of an alkaline solution made by mixing a gallon of soft soap with about half a gallon of water in which has been dissolved as much washing soda as it will take up. This is applied to the trunk of the tree from the base upwards to the forks, and about the larger branches. The liquid, which will be about the consistence of paint, should be applied with an ordinary paint brush on a fine day, when the heat of the sun will dry the solution readily, and during the early part of June, before the time when the insects deposit their eggs. This treatment will coat the tree with a sort of alkaline varnish not easily affected by rain, and seems to exempt it from attack to a great extent. I have had some 5,000 trees under my care for eight or nine years, and I have rarely found a borer in any of them under this treatment.

“The *Buprestis* deposits its eggs earlier in the season than the *Saperda*, but both lay them during the month of June or July, and the solution should be applied during the first week in June and repeated, if necessary from the wetness of the weather, in the beginning of July. Generally speaking, however, one application will be found sufficient.”

The application, it is remarked, is also useful against *Aphidæ*, and other insects resorting to the tree as a hiding place.

The oyster-shell bark louse (*Aspidiotus conchiformis*) attacks the branches. (*See Fig. 34.*) Its habits are described as follows by Mr. Saunders:—

“The worst insect we have affecting the bark of the tree is the oyster-shell bark louse (*Aspidiotus conchiformis*), which is a very minute creature and a very troublesome one. The form in which we generally detect it is in the shape of a small scale, somewhat resembling an oyster shell, which, if lifted up in August or September, will disclose a large number of minute eggs underneath. These eggs

INJURIOUS INSECTS.

THE ROOT PLANT LOUSE—*Eriosoma pyri*.

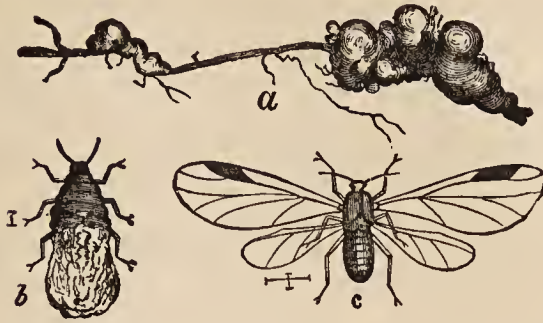


Fig. 31.

In Fig. 31 *a* represents the galls, a specimen of the work of this insect; *b* and *c* the perfect winged insects magnified; the hair lines at the sides give the correct size.

THE STRIPED BORER—*Saperda candida*.



Fig. 32.

Fig. 32—*a* the larva or grub, *b* the chrysalis, and *c* the perfect beetle.

BUPESTIS APPLE TREE BORER—*Chrysobothris femorata*.



Fig. 33.

Fig. 33, *a* shows the larva, *b* the chrysalis and *d* the perfect insect.

LARVÆ OF OYSTER SHELL BARK LOUSE—*Aspidiotus conchiformis*.



Fig. 34.

Fig. 34 represents a small piece of the bark of an apple tree twig covered by larvæ.

remain protected under this scale during the winter, and early in the following summer, as soon as the weather gets warm—sometimes in the latter part of May, sometimes a few days later—the young are hatched out. They wait for a warm day before leaving their shelter, and then they scatter themselves over the twigs of the tree, and when they find a suitable spot they fix themselves upon the tender growing bark, insert their beaks, and become permanently located, never moving afterwards. They go on sucking the juices of the tree until towards the latter end of August or September, when they attain their full size, and gradually form this scaly shell, within which the eggs are deposited, and the female louse subsequently shrivels up and dies.”

A strong alkaline solution applied to the bark is the most efficacious remedy.

The apple-tree plant louse (*Aphis mali*), “attacks the terminal growing shoots.” It is similar to the plant lice already described, and may be destroyed in the same manner, by a strong solution of alkali or tobacco water. If once washed from the twig the insects are helpless and consequently die.

The tent caterpillar (*Clisiocampa americana*) is familiar to all apple growers. (See Fig. 35.) Its description, as given by Mr. Saunders, is as follows:—

“This insect is the progeny of a moth of a brownish colour, with lighter stripes, which appears on the wing in the month of July, and deposits clusters of its eggs upon the small twigs of trees, chiefly apple trees. A single cluster of these eggs will contain several hundreds, and these are covered with a glutinous coating, which serves as a varnish to protect the egg-mass from the action of the weather. In this state the eggs remain during the winter, hatching out in the following spring, just about the time when the buds burst on the trees. The larvæ at once begin to spin their web, in which they enclose themselves for protection against the weather, and from which they issue at certain times in the day to feed on the expanding foliage. As they increase in size they enlarge their web until it presents the appearance so familiar to every one, that of a large silken enclosure, containing, perhaps, two or three hundred worms or larvæ, from an inch to an inch and a half or three-quarters in length. They have the peculiar habit of all going out together to feed at certain times in the day.”

Its forest tree relative (*Clisiocampa sylvatica*)—See Fig. 36—constructs a sort of web on the side of the trunks or large branches of trees. Independent of the natural means for the destruction of the tent caterpillar, Mr. Saunders makes the following suggestions on this point:—

“I would advise the cutting off and destroying of the egg-clusters during the winter, when they can be readily seen, and an inspection of the trees in the spring, to see that none have escaped. In case any of the pests have survived till then, they will have begun to construct their web, and can be easily removed by cutting off the twig on which they rest, or if high up on the tree, by a pole with a cloth twisted round the end of it. If proper care is exercised, this caterpillar need never be destructive in any orchard. But with the forest tent caterpillar the case is very different. It feeds upon the leaves of so many different trees that it has a

much wider area in which to breed, and whenever it is abundant, it is enormously so. In my own orchard, in which there are about 5,000 trees, I was obliged for two years to keep two men constantly employed for five or six weeks each season in killing these caterpillars, in order to preserve it from destruction. From the smaller trees the caterpillars may be removed by jarring, but, being extremely active, they soon take up their position on the tree again if not at once despatched. In thinking over the matter it occurred to me that as each of the fleshy pro-legs of the caterpillar is furnished with a fringe of hooks, it would be a difficult thing for it to crawl over a material like cotton batting, so I tied strips of that substance, some three or four inches wide, around the lower part of the trunks of the trees, tight in the centre, so that the upper part of the strips would overhang the middle somewhat, and watched the result. I found that the larvæ would crawl up the tree until they reached this band, and then they would go round and round, until they apparently became tired and went down again. In a letter to one of our local papers I mentioned the matter, and the plan was extensively tried, and it seemed to work very well indeed, almost entirely preventing the caterpillar from climbing up the trees. I consider this species, where abundant, as more destructive to the apple than all other caterpillars put together."

Vigilance and the constant hunting of the pest, at any and every stage of its existence, but particularly in the egg state, is the grand cure for the tent caterpillar.

"If anybody," says Mr. Beadle, "tells me his orchard is overrun with the common tent caterpillar, I say it is his own fault."

Mr. Roy says on the same subject:—

"Two or three years ago the tent caterpillar did great mischief. The remedy against them is to go over the trees in winter, walk along on the crust of the snow and examine the trees, and you will readily detect the rings of eggs. They should be taken off in the winter and put in the fire. I have done so in my orchard invariably. Any man who does this will keep his orchard free from caterpillars, that is, provided his neighbours do the same."

Whether the activity of orchardists in following up this pest, or the seasons, have reduced its numbers, certain it is that recently it has, in many places, all but disappeared. Let no one, however, forget that when dealing with so prolific a brood "eternal vigilance" is the price of immunity from its ravages.

The Tussock moth (*Orgyia leucostigma*), and its handsome caterpillar, the latter emerging from the egg clusters the moth has deposited glued to a dead leaf and attached to a twig, the yellow-necked caterpillar (*Datana ministra*), and red humped caterpillar (*Notodonta concinna*), bred from egg clusters on the twigs, the foliage of which they afterwards destroy, and the fall web worm, which spins a web smaller than but something like the tent caterpillar, must all be combated like the latter by a careful search for the egg clusters, or by destroying the larvæ as soon as they appear. (See Fig. 37.)

Of the canker-worm, Mr. Saunders says:—

"There are two species of canker-worms which, until late years, have been confounded with each other. One species produces a moth late in autumn, and

INJURIOUS INSECTS.

THE TENT CATERPILLAR—*Clisiocampa Americana*.

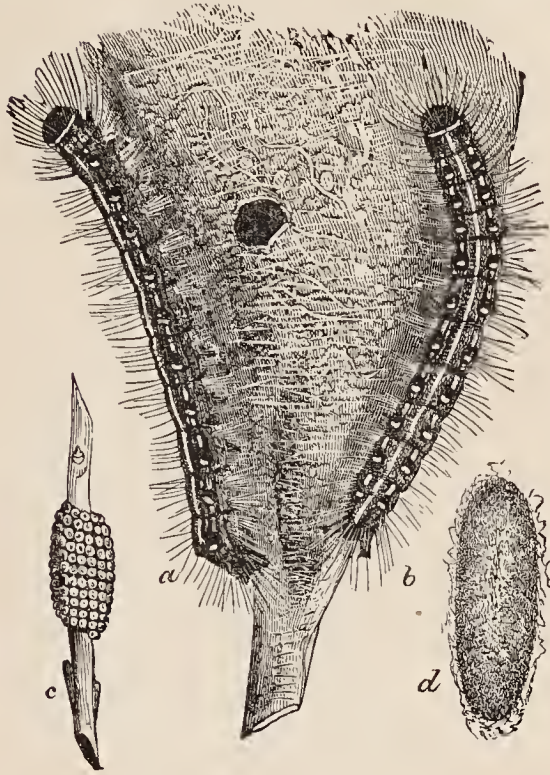


Fig. 35.

In *Fig. 35* we have a representation of these caterpillars at *a* and *b* resting on a portion of the web; *d* is the cocoon which contains the insect in the chrysalis state, and *c* one of the egg masses.

THE FOREST TENT CATERPILLAR—*Clisiocampa sylvatica*.



Fig. 36.

LARVA OF THE TUSOCK MOTH—*Orgyia leucostigma*.

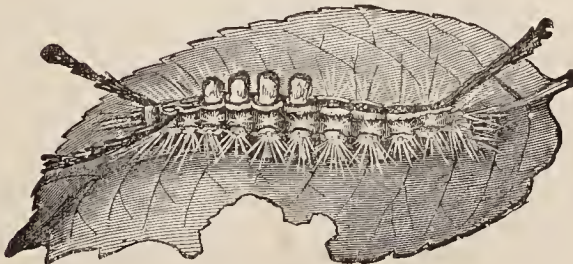


Fig. 37.

INJURIOUS INSECTS.

CANKER WORMS.

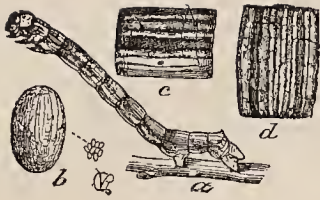


Fig. 38.

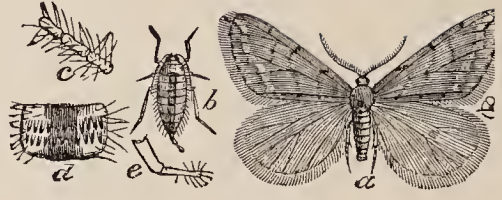


Fig. 39.

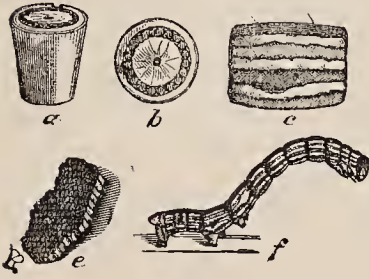


Fig. 40.



Fig. 41.

Fig. 38 shows the larva and egg and *Fig. 39* the moths, male and female, of *vernata*, the spring form ; while *Figs. 40* and *41* represent similar stages of the autumn insect.

CECROPIA EMPEROR MOTH—*Samia Cecropia*.



Fig. 42.

the other partly in autumn, but chiefly in the following spring. There are perceptible differences in their larval and moth characteristics which are sufficient to establish them as distinct, but as their habits are precisely similar we can speak of the two species as one.

"After severe weather, when it might have been expected that almost all insect life would be destroyed, especially anything so delicate in structure as these moths are, they may be met with in the woods flying about in all directions. They seem, in fact, to require a great amount of cold to fully develop them. The females of both species are without wings, the male only possessing powers of flight. The female is very much like the female *Orgyia*, being a spider-like creature, with six long legs, and a large body thickly clothed with scales. She is very unattractive in appearance, while the male is a very beautiful insect indeed. After copulation the female climbs up the tree, and deposits her eggs, usually on the twigs. The larvæ are hatched out in the spring, and quite early in the summer attain their growth. Their method of walking is by 'looping' their bodies, viz., by drawing the hinder feet close to the fore feet, again extending the latter, and so on. They are prettily striped with yellow and brown. After attaining its full growth—late in June, or early in July—the insect descends to the earth and forms a chrysalis which remains undeveloped until the advent of the cold season, when the moth breaks through and escapes to perpetuate its species. This insect has been very troublesome in many parts of the United States, attacking not only the apple tree but several varieties of shade trees, particularly the elm." (See Figs. 38, 39, 40 and 41.)

As to remedies, Mr. Saunders says:—

"Various means have been resorted to to prevent the female from climbing up the trees and depositing her eggs. Strips of tin or zinc have been fastened about the tree, about three inches wide and sloping downwards, like an inverted funnel, so that the insect could not surmount them, also bandages of cotton and other fabrics, daubed with tar, have been used with the same end in view, and by these means the trees have, in many instances, been saved from serious damage. I have not had much opportunity of judging whether the English sparrow has had any effect in reducing the number of these insects, but I am of opinion that it has not."

The beautiful Cecropia Emperor moth, appears during the month of June and deposits her eggs singly on the apple tree. (See Fig. 42.) The subsequent history of the insect is thus described by Mr. Saunders:—

"These, during the next five or six weeks, hatch into caterpillars, which finally grow to be three or four inches long, and about as thick as a man's finger or a little thicker. They are green in colour, and are covered with warts; those on the top of the anterior segments are large and of a coral red colour, the remainder are yellow, excepting those on the second and hinder segments, which, in common with the smaller ones along the sides, are blue (see Fig. 43). Early in the autumn the larva spins its strong silken cocoon, perhaps three inches in length, inside of which it changes to a chrysalis and remains during the winter (see Fig. 44), developing the moth the following season, about the beginning of June."

The Cecropia is found also on the European alder as well as on the plum, currant and lilac, although it prefers the apple. Parasites keep it in check, and Mr. Brodie mentions that, in 1861, he collected in Whitechurch over a hundred

Cecropia cocoons, only three of which were living, the others having been punctured by woodpeckers.

The Rascal Leaf Crumpler (*Phycita nebulo*) is described by Mr. Saunders as "constructing a rather dead-looking case, not unlike a horn in shape, in which it passes the winter in the caterpillar state, and from which it makes its exit in spring, using the case as a place of retreat, travelling out in search of food and returning to it when it has eaten sufficient to satisfy itself" by gnawing the bark of the twigs early in the spring, thus at times seriously injuring the tree's growth. Hand picking appears to be the only artificial remedy.

The Codling Worm (*Carpocapsa pomonella*),—see Fig. 45—which makes its attacks directly on the fruit, is perhaps the most serious of the pests infesting the apple. Every apple grower and almost every apple consumer knows something of its ravages. The witnesses in the fruit department of the late inquiry were one and all complainants against this insect, of whose habits Mr. Saunders gives the following description:—

"It is a European importation, and a pest which causes the loss of many thousand dollars' worth of fruit every year. The moth is on the wing quite early in the season, about the time the apple trees are in blossom, and as soon as the fruit is formed, or almost before it is formed, the insect deposits her eggs in the upper end of the apple blossom. These eggs are soon hatched into young larvæ, which penetrate into the growing fruit, and mature there when the fruit is about half grown. At that time we notice a great many apples fall from the trees. These are brought down from the effect of the presence of the larvæ. The irritation set up in the fruit by them, brings on premature ripeness, and consequent falling from the tree. This half-grown fruit is, of course, useless for any purpose, but the fact of its falling to the ground sometimes has a beneficial effect upon the remainder of the crop, which thereupon receives a greater proportion of the juices of the tree, and thus has a better chance of reaching full size before maturity. The larva sometimes leaves the fruit before it falls, and crawls down the tree looking for a sheltered spot in which to spin its cocoon. Sometimes it falls to the earth with the apple, and in that case it generally ascends the trunk of the tree in search of a proper hiding place in which to go into chrysalis. This habit the larva has of seeking for a sheltered place, in which to spend the inactive stage of its existence, has suggested a very useful remedy for counteracting its ravages."

The remedy suggested is as follows:—

"By tying, about the middle of the trunk, a bandage of old cotton cloth, or even paper, a suitable hiding place is presented to the larva, which at once makes use of it by entering in and going into chrysalis there. If the bandage is applied to a tree on which there is a good crop of fruit, and tied in the middle, I have found, as a rule, that there will be as many or even more larvæ above the string than below, showing that a large proportion of them leave the fruit before it drops and crawl down the tree. The insect remains, during the summer months, about ten or twelve days or sometimes a fortnight in the chrysalis state, and the

INJURIOUS INSECTS.

CATERPILLAR OF CECROPIA EMPEROR MOTH

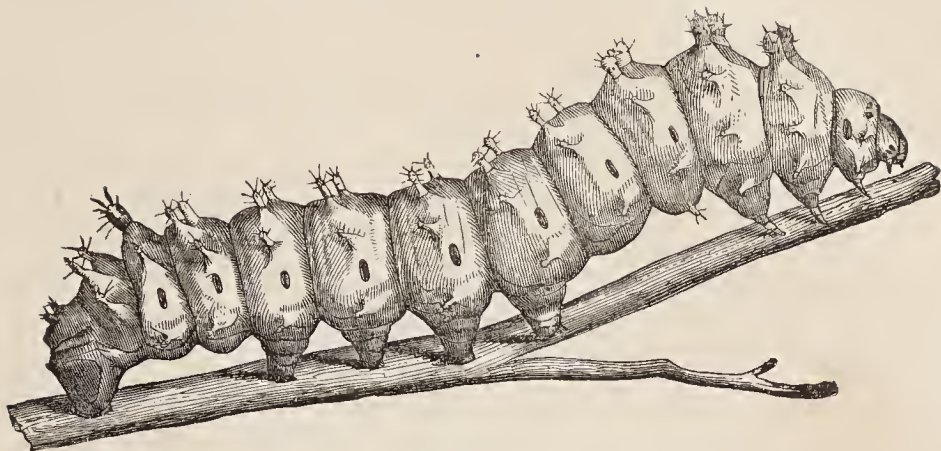


Fig. 43.

COCOON OF CECROPIA.



Fig. 44.

THE CODLING WORM.

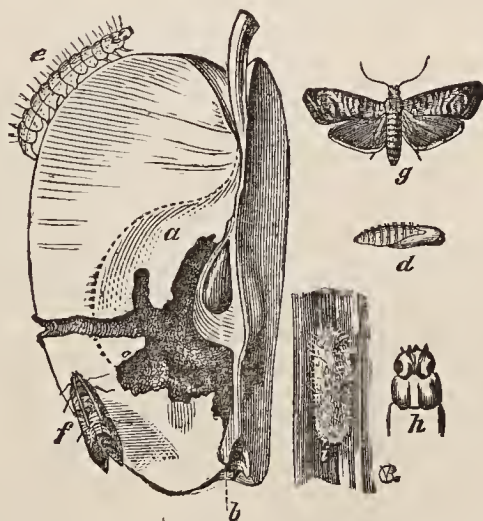


Fig. 45.

In *Fig. 45*, *f* and *g* represent the moth with the wings closed and expanded, *e* the larva, and *d* the chrysalis.

bandages ought to be examined once a week so as to make sure that none escape. In this way a very large number of pupæ may be collected, and the trees preserved, in a great measure, from the visitation of a second brood, which otherwise would be shortly hatched."

The insect, if allowed to escape from its chrysalis state in the summer, produces a second brood, and this often so late in the fall as to remain in the fruit when it ripens and is either pulled or falls from the tree. In either case the immediate gathering up of all infested fruit, and its consignment to pigs or its disposal in such a manner as to destroy the worms, is most important, but Mr. Saunders inclines to the belief that, if the plan he suggests were carefully adopted in every instance, the worms would be so diminished in numbers as to be comparatively harmless in the following season, and ultimately nearly got rid of. But, where the orchards of different persons are contiguous, common action is necessary, or any one idle orchardist may re-stock his neighbours' trees, in spite of their precautions. In shipping apples, the utmost care should be taken to reject wormy fruit, as one or two infested specimens may discredit the whole barrelful.

Mr. Beadle does not, in his evidence, say much for the vigilance of many of our fruit growers in regard to the Codling Worm. He says:—

"Our orchardists have not yet learned a way of fighting the Codling moth. It is so small, and does its work so secretly that it is not found out until the apples are ruined. I don't know of any one who has adopted a persistent course to get rid of it. There have been attempts, to a limited extent, to trap the larvæ by bandages. I am satisfied from experiments by myself and others that they can be trapped by placing bands of paper or woollen cloth around the tree; into these the larvæ will go to change to the chrysalis state. The bands should be examined every week or ten days. I have been told that by placing shingles, fastened together in pairs, so close that they almost touch each other about the tree, the insects may be caught, as they will creep between them in search of a hiding-place. Some people accomplish the same object by putting bits of rag at the foot of the tree on the ground. By some or all of these means I believe their numbers could be greatly reduced, if there was a combined effort by orchardists to do it."

Mr. Charles Arnold says of this pest:—

"The Codling Worm is very destructive. Bands of paper or cotton batting or old cloth, tied around the trunks of the trees, and untied every week or so, are the best means of catching the larvæ and preventing the moths. Generally we take several thicknesses of paper so as to give them a good hiding place. If that remedy was generally adopted by fruit growers I am satisfied the moth could be kept under. It is a blessing for us that some years we have no apples, as then we are able to get rid of the moth. The bandages I have spoken of would need to be examined every week during the summer. I know of no other remedy for them though I have heard of a great many."

Mr. Allan, of Goderich, who complains that the Codling Worm is becoming more destructive every year, mentions that some of the orchardists in his district, in addition to the rag or paper bandage remedy, light fires under the trees at night which attract the moths to their destruction.

Insects Injurious to the Pear.

In the evidence now under review the pear-tree slug (*Selandria cerasi*) is the only one mentioned as particularly affecting the pear. It also visits the cherry and plum. It is described as a disgusting, slimy little creature, with the anterior segments enlarged, presenting an appearance something like a tadpole, and accompanied by an unpleasant odour. It destroys the leaves of the tree and thus impairs the maturing of the fruit. Mr. Saunders says:—

“It is the progeny of a four-winged fly of a blackish colour, with transparent wings, which is abroad early in the summer. The insect spends the winter in the chrysalis state in the ground, and the flies emerge early in the season, laying their eggs on the pear, cherry, or plum, which hatch out into the slugs. From what I have seen of the insect, I believe it to be double-brooded, but I am not quite sure.”

Among many remedies, he has found that the use of hellebore is the most effectual. An ounce of hellebore in a pailful of water, applied with a syringe, will soon rid the tree, of them. (See Fig. 46.)

Insects Injurious to the Plum.

The plum has numerous enemies. The first of these on the list is the Plum Sphinx (*Sphinx drupiferarum*), of which a life size representation with one of its moth is given. It is described as follows:—

“It is a large green caterpillar, with white stripes on the sides, and a prominent horn at the tail. It attains the length, at maturity, of perhaps three or three and a half inches, and is correspondingly thick. This produces a very handsome sphinx moth, which is a night-flying insect, and has a flight somewhat similar to that of the humming bird. It deposits its eggs about the month of June, and the larva attains its maturity about the end of autumn, when it descends from the tree, enters the ground and changes to a chrysalis, in which form it remains until the following season.” (See Figs. 47, 48 and 49.)

The Polyphemus caterpillar (*Telea polyphemus*),—See Figs. 50, 51 and 52—is described as “one of our handsomest insects” and also the progeny of one of the emperor moths.

“The larva,” says Mr. Saunders, “is about as thick as a man’s thumb, of a greenish yellow colour, and with the segments of the body very deeply cut into. These segments are covered with tubercles which have clusters of small spines proceeding from them. Its history is very similar to that of the sphinx which I have just mentioned. Instead, however, of forming a chrysalis under ground it spins a cocoon inside of two or three leaves of the tree on which it is feeding, which it draws together, and within this enclosure changes to the pupa state. This cocoon, being attached to the foliage, falls to the ground with the leaves in the autumn, remaining there until the following summer, when, in the early days of June, the large handsome moth is produced.”

INJURIOUS INSECTS.

THE PEAR TREE SLUG—*Selandria cerasi*.

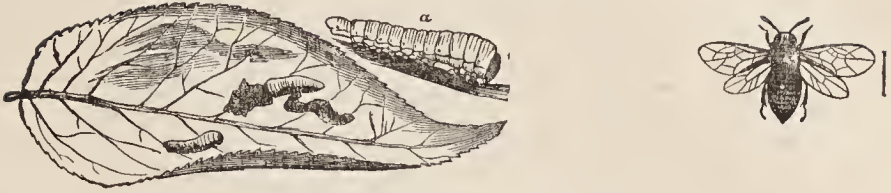


Fig. 46.

Fig. 46 represents this slug at *a* full grown, and also in a younger state feeding on the leaf; *b* represents the perfect fly.

THE PLUM SPHINX AND CHRYSALIS—*Sphinx drupiferarum*.

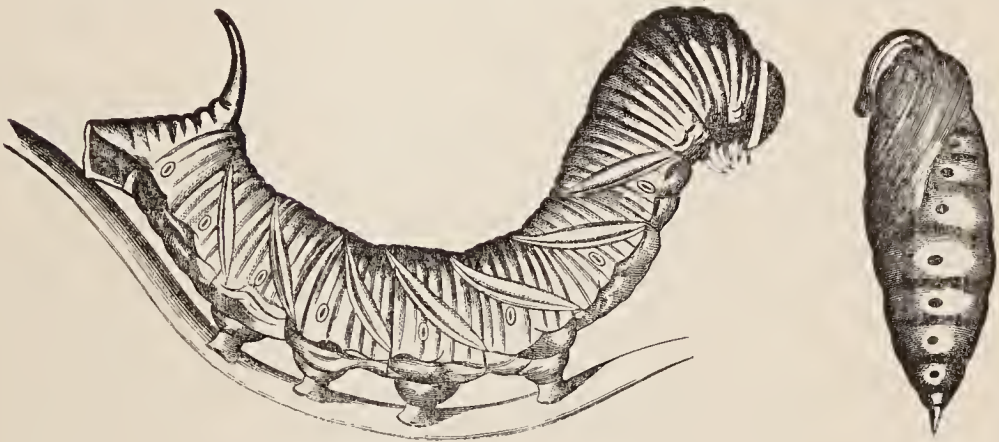


Fig. 47.

Fig. 48.

PLUM SPHINX MOTH.



Fig. 49.

Glancing a moment at the minute Eye-spotted Bud-moth (*Grapholitha oculana*),—see *Fig. 53*—a tiny creature found in the pear and occasionally in the apple, as well as the plum, and the Oblique-banded Leaf Roller (*Loxotania rosaceana*),—See *Figs. 54 and 55*—also somewhat promiscuous in its dietary, the next pest in order is the too-familiar Curculio (*Conotrachelus nenuphar*). (See *Fig. 56*.) In this, as in some other cases—where it is necessary, to ensure distinctness, to magnify the illustration—the faint black lines represent the natural size of the insect. The Curculio is of the same family as, and not very unlike, the peabug. It is small in size, and of a rough gray or blackish colour, and when resting looks very much like a dried bud of the tree.

Its life history and habits, and the readiest and most efficacious known means for its destruction, are thus referred to by Mr. Saunders. He says :

“It usually passes the winter in the ground, in the chrysalis state, though the perfect insect sometimes escapes from the chrysalis, during the later autumn months, and then may be found under the bark hibernating in the winter. As soon as the trees are in blossom the curculios may be found in abundance upon them, waiting for the first signs of development in the young fruit. Before the blossoms have fairly left the tree, the tender fruit is detected by this watchful pest, which at once begins to deposit eggs in it. These shortly hatch into small grubs, which penetrate into the fruit, causing decay and premature falling. The jarring ought to be begun early in the year, while the trees are in blossom, and in this way a large proportion of the curculios may be collected before they have done any mischief; in fact, too much stress cannot be laid upon the recommendation to begin the jarring process quite early in the season.

“I have found them to be quite common on the trees at night, and by enclosing specimens in boxes covered with black cloth, so that no light could get in, have found them to deposit eggs notwithstanding the darkness. They are active during the day, and seem to be almost as active at night. Their periods of inactivity, if they have any, seem to be about the cool of the morning or early in the evening. I do not know whether they keep hard at work during the entire season, but presume that, if the weather were cold, they would remain torpid during a portion of the day or night. I consider the jarring method quite sufficient as a remedy to keep the insect in check, when faithfully followed.”

The jarring process is thus described by Mr. Beadle :—

“The simplest contrivance which I could recommend, and it is within the reach of everybody, is to get a few yards of cotton cloth and two strips of lath, to which each end of the cloth is to be fastened. A pair of these sheets should be laid on the ground at the foot of the tree, just at the season of the year when the blossoms have fallen and the fruit is beginning to appear from the calyx. The tree should be suddenly jarred, and the insects will drop upon the cloth. This should be done every morning before the heat of the day, as the creatures do not fly then, but in the middle of the day they are on the wing, and you will not accomplish your end.

“There are two ways of jarring the trees so as not to injure the trunk; either saw off a small limb about one inch in diameter, leaving the stump a few inches long, and strike on the end of that; or, you may bore a small hole with a bit, insert a round rod of iron, and leave it there to strike upon. Shaking the tree will not bring the insects down, as they seem to think that that is merely the wind

swaying the tree ; but suddenly jarring the tree seems to impress them with fear—they curl their feet up and drop immediately to the ground. They look like a dry bud as they lie curled up. The sheet can be carried by the slats, and the insects should be emptied into a vessel of water which should be at hand. You can then destroy them at your leisure.

“This process should be continued at least once a day until you find the numbers so reduced that you can safely let it go for two or three days. It is usual to continue the operation about three weeks. I don't think that even in that time the plum has arrived at such a state of maturity that it can defy the curculio, but the object of the insect is to lay the eggs, and of course the season for laying the eggs is past in that time.”

Placing under the trees chips in which the curculios may take refuge only to be captured ; paving the ground around the trees, so that the curculios, when they fall with the fruit, may have no hiding place, and be forced to wander about until destroyed ; burning coal tar under the trees ; gathering up the fallen fruit and destroying it with its occupant ; enticing the curculios into bottles filled with some sweet liquid, and placing elder branches in the trees, may all have some value, but systematic jarring is the best and by far the most effectual remedy.

In Essex, however, Mr. Dougall and others claim to have effectually protected their plum-orchards from the curculio by keeping chickens. Mr. Dougall says :—

“The curculio is easily avoided by keeping plenty of hens and chickens. My plum trees are loaded down with fruit, and there is not the sting of a curculio to be seen, while just outside of my orchard nearly every plum has been stung. I planted my trees about ten feet apart, and I have good fences so that the fowls cannot get through. There should be enough fowls to keep down the grass and weeds, otherwise the curculios would escape. In my plum orchard there is no grass or weeds at all ; in fact, I have to cut grass for my fowls, and I have more plums on my trees than they can bear without support. Shaking the trees is a very good plan, but I gave it up after a number of years' experience. My man had shaken the trees every morning for three weeks, and then there came three days of constant rainy weather, after which the fruit was all stung with curculio. I find that keeping fowls is a perfect protection against the insect. I have a few plum trees in my nursery, but I cannot get a plum off them, because there are no fowls there. In our part of the country we can always get a high price for spring chickens in the Detroit market. If you have only a few plum trees in your garden, and do not want the chickens to run at large, you could put a coop of young chickens under the trees and they will devour the insects.”

The disgusted condition of the Huron plum growers, leading to the almost entire neglect of their plum crop, has been referred to in another chapter. With an inexhaustible demand for eggs, and a very good market for chickens, it might be well if they would dissolve a partnership with the curculio that has proved so disastrous, and, doing their own fair share of jarring, take a few Dorkings, Light Brahmas, or Plymouth Rocks into their confidence.

The parasitical allies of the fruit grower in this connection have yet to be mentioned.

INJURIOUS INSECTS.

THE POLYPHEMUS CATERPILLAR—*Telea polyphemus*.

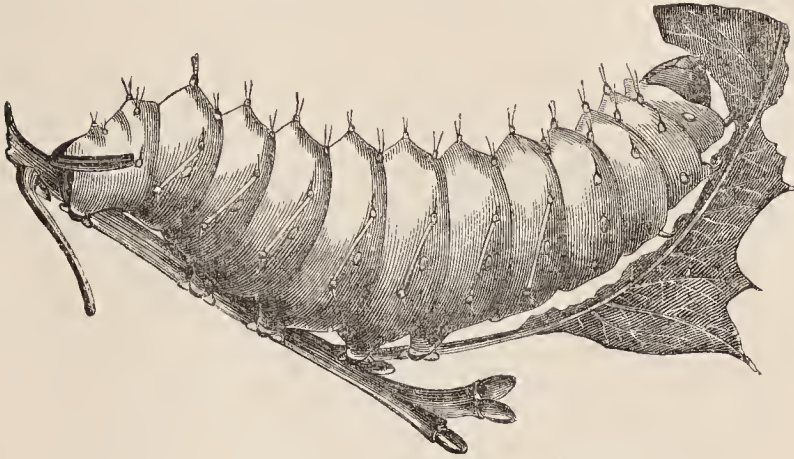


Fig. 50.

POLYPHEMUS MOTH.

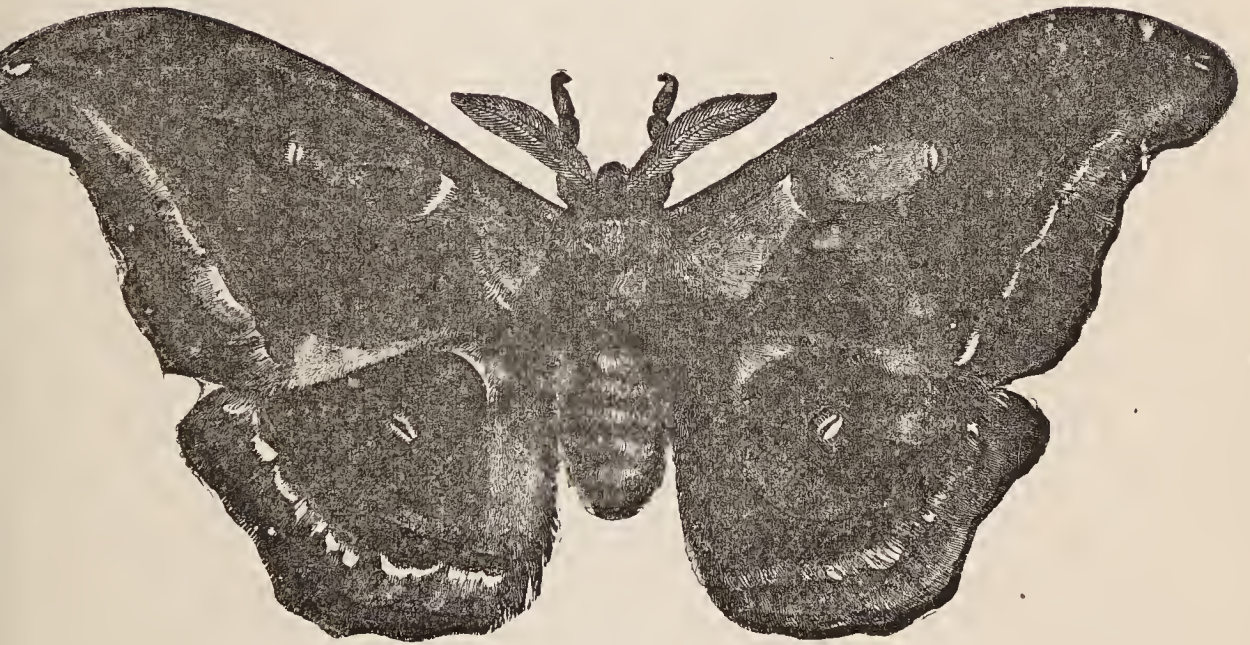


Fig. 51.

COCOON OF POLYPHEMUS MOTH.



Fig. 52.

EYE-SPOTTED BUD MOTH—
Grapholitha oculana.



Fig. 53—Larva and perfect insect.

INJURIOUS INSECTS.

OBLIQUE-BANDED LEAF ROLLER, LARVA, AND MOTH—*Loxotania rosaceana*.

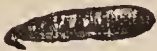


Fig. 54.



Fig. 55.

THE CURCULIO—*Conotrachelus nenuphar*.

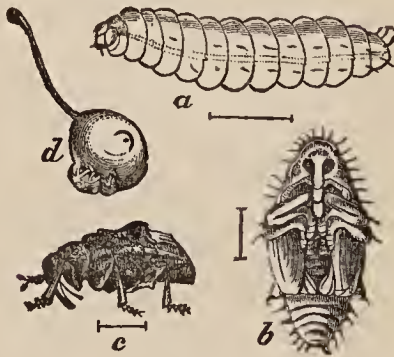


Fig. 56.

Fig. 56, *c* represents the beetle, *a* the larva and *b* the chrysalis (all magnified); *d*, curculio (natural size) at work on a young plum.

THE PEACH BORER—*Ageria exitiosa*.



Fig. 57.

In Fig. 57, *1* shows the female insect, and *2* the male.

Insects injurious to the Peach.

The peach appears to have only one special enemy, the Peach Borer (*Egeria exitiosa*),—see *Fig. 57*—described as follows:—

“The peach borer is a wasp-like insect, with transparent wings, and a richly ornamented body, banded and striped with gold, which deposits its eggs about the base of the trunk. The eggs hatch out, and the larvæ bore into the sapwood, and cause an exudation of gummy matter which appears in masses about the base of the tree. The larvæ seem partly to live in this gummy substance and partly in the sapwood of the tree. Sometimes three or four are found on the same tree, occasionally girdling and destroying it, but always inducing more or less of a diseased condition, and impairing its vigour. Altogether it is a very objectionable and destructive insect.”

As to the means of combatting the operations of this pest, it is remarked:—

“It is usual on the appearance of these gummy masses to cut them away, trace out the larva and destroy it. By watchfulness in this way its depredations may be stopped. It has been suggested that banking up the trees with earth would prevent the insects from depositing their eggs, and the method is very strongly recommended by those who have tried it. As a rule those who look after their peach trees closely have not much trouble with the borer. It is easily discovered by this gummy exudation, and can be easily taken out and destroyed if it is looked after at the proper season.”

Insects injurious to Small Fruits.

Coming next to the insects injurious to the smaller fruits, the Imported Saw-fly (*Nematus ventricosus*)—see *Figs. 58, 59 and 60*—is one of the most troublesome to the currant and gooseberry. It appeared some years ago in New York State and spread thence to Canada. It is described as follows:—

“The parent insect is a small transparent-winged fly about the size of the ordinary house fly, but furnished with four wings. This fly makes its appearance very early in the season, and as the young foliage is expanding, deposits its eggs, usually along the leaves of the gooseberry, in regular rows on the under side.

“The eggs are set end to end, and are fastened by some glutinous substance. In a few days these eggs hatch out little grubs, which proceed to eat holes in the leaves. On turning the leaves up you will find the young colony of larvæ very numerous, and you can sometimes destroy the whole brood by picking two or three of the leaves and trampling them under foot. If not checked at that time they soon scatter over the bush, and you find the foliage disappearing with great rapidity, first from the lower portion of the bush, and from that upwards, until in a very brief space the whole of the foliage of the bush, or nearly the whole of it, may be destroyed, leaving the branches bare.”

“The insect,” says Mr. Saunders, “is at least double brooded, and it is sometimes supposed to have more than two broods. If it is only double-brooded, the broods appear at different periods, so that you can almost at any time during the season find larvæ on the bushes in different stages of development. You will find the larvæ most abundant in the early part of the season, devouring the foliage as soon as it is thoroughly developed, and, when full grown, going to the surface of the

ground, where they construct their cocoons among rubbish or decaying leaves, coming out early in the summer and depositing their eggs for a later brood."

For this insect and the native saw-fly, which is so scarce as to be of little annoyance, hellebore is a sufficient remedy.

Another insect attacking more particularly the black and the red currant is the Currant Geometer or measuring worm (*Ellopiæ ribeæria*). (See Fig. 61.) As to its characteristics and resistance to mild methods of treatment, Mr. Saunders says:—

"It is a spotted larva about an inch and a quarter or an inch and a half long when it is matured, a great feeder, and a much more difficult insect to destroy than the saw-fly. Hellebore, which will promptly destroy the saw-fly, will have very little effect on the geometer. There is something very robust in its constitution, which enables it to resist the action of this poison, and it requires to be used much more strongly, and even then it will not always prove effectual. I have found that Paris green is much more effectual, but it is undesirable to use this poison after the fruit is formed. The insect appears very early, and if the bushes are sprinkled with a solution of Paris green in the early spring, before the fruit is formed, I think there is no danger attending its use. Still, if hellebore and water, used of additional strength, will answer all the purpose, I should prefer it to Paris green. This insect has a habit of dropping from the bushes when they are struck, and suspending itself by a silken thread, and then, with a stick, you can gather a number of these threads and draw the insects together and trample them under foot."

The Spinous Currant Caterpillar (*Grapta progne*), a pretty but not often very hurtful butterfly, and the four-striped plant bug (*Capsus linearis*), which punctures the leaves and so stunts the growth of the bush, are noticed. The only known remedy for the latter is the old-fashioned one to "catch him and kill him."

The Gooseberry Fruit Worm (*Pempelia grossularia*),—see Fig. 62—which attacks the interior of the gooseberry, is thus described:—

"The parent is a small narrow-winged gray moth, which when its wings are expanded measures nearly an inch. It spends the winter in the chrysalis state, in the ground, and early in the spring the moth appears on the wing; having escaped from the chrysalis about the time the gooseberries are formed, and growing rapidly, this moth deposits an egg here and there on the fruit. The egg hatches, and the young larva eats its way into the fruit, and lives in the interior portion of the gooseberry, and in a very short time the berry it feeds upon becomes discoloured, and having partially consumed it, the insect takes to another, and finally it draws together, with silken webs, a cluster of three or four berries, living in one as a sort of home, from which it issues to feed on the berries about it. When it attains a growth of about three-quarters of an inch, it descends to the ground, enters into the chrysalis state, and remains there until the following spring, when the moth issues to enter upon its destructive mission. There is only one brood of this insect during the year, but it is getting very destructive, sometimes destroying as much as twenty-five or thirty per cent. of the gooseberry crop in some sections."

INJURIOUS INSECTS.

THE SAW FLY—*Nematus ventricosus*.

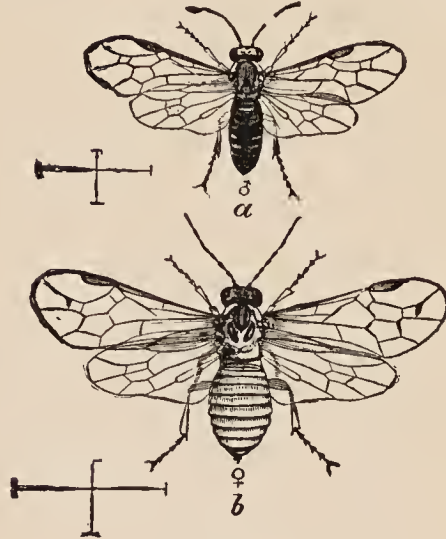


Fig. 58.

I Fig. 58 we have represented both male and female flies—*a* the male, *b* the female.

EGGS OF THE SAW FLY.



Fig. 59.





INJURIOUS INSECTS.

LARVA OF SAW FLY—NEARLY FULL GROWN—FEEDING.



Fig. 60.

CURRENT GEOMETER, OR MEASURING WORM—*Ellopia ribearia*.



Fig. 61.

Of artificial remedies for the fruit worm, Mr. Saunders says:—

“By jarring the bushes you can collect this larva in the same way as you can the gooseberry geometer. It drops to the ground, retaining its hold on the bush by means of a silken thread, by which it climbs up again when the danger is past. By drawing the threads together with a stick, you can sometimes readily collect a number of specimens of the larva. I have found that by sprinkling the bushes with air-slacked lime, about the time that the moths appear, they can be kept almost entirely free from the attacks of this insect. Where the lime is used the eggs do not seem to be deposited on the berries, as insects have a great aversion to this substance. But such a remedy does not destroy the insect; it only drives it somewhere else.”

Two species of currant borer, the Imported and American, are next in the list, and described as follows:—

“The imported currant borer (*Ægeria tipuliformis*) is a small wasp-like moth with transparent wings, and a body banded with gold. It flies about very actively in the middle of the day, when the sun is shining brightly. After pairing, the female deposits her eggs upon the twigs, generally one at the base of a bud; when this is hatched, the young grub bores into the bark of the stem to the centre, and works up and down, devouring the substance of the stem, and finally when it attains its full growth, eating a hole almost entirely through the currant stem, leaving only about the thickness of tissue paper of the bark unbroken; and inside of this opening it forms a chrysalis, with the head of the chrysalis pointing to the thin layer of bark. When the chrysalis is about to change, it has only to break through this thin layer of bark, and escape. (See Fig. 63.)

“The other species, the American currant borer (*Psenocerus supernotatus*), has similar habits, although it belongs to an entirely different family—the family of long-horned beetles. It deposits its eggs in the same manner as the *Ægeria*; the larvæ go through all their changes within the stem of the bush, and finally emerge in the perfect beetle form by eating their way through the stem. The remedy for these two pests is to remove, at the end of the season and during the winter, all those stems which manifest any symptom of being injured, and burn them. In that way you destroy the chrysalids, and thus lessen the danger of their increase.” (See Fig. 64.)

A Raspberry Cane Borer (*Oberea tripuncta*) is described as a “cylindrical beetle about five-eighths of an inch in length, of a dark colour, and with a pale yellowish thorax, with three spots on the thorax, and with long horns.”

Its operations are thus noticed:—

“When attacking the raspberry it selects the tip of the growing cane, and biting with its jaws, makes a series of punctures around the young growth, giving it the appearance of having a ring around it. Then beginning above, it makes a second ring about an inch from the first, and between these two rings it deposits an egg in the substance of the cane. The result is that the tip of the cane withers in a few days. The object in thus biting the cane is supposed to be to lessen the flow of sap towards the parts, as the sap might possibly injure the egg embedded in the substance of the cane. The egg hatches, and the larva as soon as hatched proceeds to eat down into the centre of the cane, and spends its larval period in consuming the interior, completing its transformation within the cane—changing to a chrysalis—and finally the next spring eating its way out of the cane, a perfect beetle.”

The pest may be prevented from increasing, by promptly breaking off the cane down to the second ring made by the insect.

The Tree Cricket is another enemy of the raspberry, as well as of the grape-vine, in connection with which it is noticed.

A green Saw-fly, too, is troublesome (*Selandria rubi*). Of this insect Mr. Saunders says:—

“There is a green saw-fly, *Selandria rubi*, which attacks the raspberry, and is a very troublesome insect. When full grown it is about three-quarters of an inch long, and is covered with small hair-like spines, arising from small green tubercles. It is the progeny of a small, black, transparent-winged fly, somewhat similar to the gooseberry saw-fly, but smaller. It has a strange saw-like apparatus at the posterior end of its body, by means of which it saws little slits into the substance of the leaf of the raspberry, and places its egg under the surface. There it swells, and finally produces a small larva, which makes its exit to the outer surface of the leaf, and feeds on the substance, avoiding the veins or ribs of the leaf, and thus skeletonizes it. It is so near the colour of the raspberry leaf that it is very difficult of detection, and it requires a practised eye to find it, but you can see the effect of its work very speedily, and it is easily killed by the application of hellebore.”

Another insect, a small geometer, *Aplodes rubivora*, represented in its perfect state by a pretty green moth, also attacks the raspberry, but not very severely. (See Fig. 65.)

The Strawberry's enemies are few in number, and are briefly described by Mr. Saunders as follows:—

“There are few insects that affect the strawberry. One of these is the Crown Borer (*Anarsia lineatella*). It is the larva of a small moth which deposits its egg on the crown of the strawberry. This, when hatched, produces a larva which eats its way in various directions through the crown of the plant, and in a short time so injures it that it is almost useless. In past seasons, Mr. Luke Bishop, near St. Thomas, and Mr. Chas. Arnold, of Paris, have both suffered from it very seriously. It is an insect worth noting, because it may become very widely disseminated, and if it established itself in any of the large strawberry centres, it would become a very serious evil. Lime strewed among the strawberry vines has been suggested as a remedy, but I very much doubt whether we can find any remedy which will be effectual other than digging up the affected vines and burning them.

“The larva of our common May beetle is very destructive. (See Fig. 66.) It feeds on the roots of plants and grasses, and seems to be very partial to the strawberry roots. A few of these insects will work great destruction in a few days; the plants wither, and you see no reason for it until you dig in the ground and find this grub at work. It frequently attacks other plants as well as the strawberry, and sometimes eats the tubers of the potato. It will eat almost anything in the way of a root or tuber, whether small or large, and one specimen is capable of devouring a great deal of food in a year. In its perfect state it is a leaf-eating beetle, and congregates on the leaves of the cherry and other trees, but during the

INJURIOUS INSECTS.

GOOSEBERRY FRUIT WORM—
Pempelia grossularia.



Fig. 62—Moth and Cocoon and Larva.

THE IMPORTED CURRANT BORER—
Aegeria tipuliformis.



Fig. 63.

THE AMERICAN CURRANT BORER—*Psenoscerus supernotatus*.



Fig. 64.

GREEN (RASPBERRY) MOTH—*Aplodes rubivora*.



Fig. 65.

In *Fig. 65* we have the curious larva of this insect shown feeding on the fruit; *b* represents the side of one of the rings or segments of the caterpillar's body much magnified; *c* the moth of a natural size, and *d* one pair of the wings magnified.

COMMON MAY BEETLE.

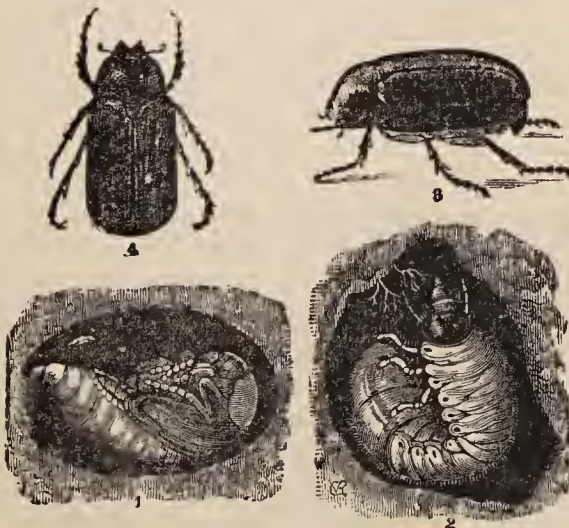


Fig. 66.

In *Fig. 66*, *2* represents the larvæ, *1* the chrysalis, *3* and *4* the mature insect.



day-time it is torpid, and if the trees are then well shaken the beetles fall to the ground, when they can be collected and destroyed. We have never had them so excessively abundant as to be obliged to resort to any means of this sort. There are two or three small lepidopterous insects, leaf rollers, which attack the strawberry. One is very common—the *Anchylopera fragaria*. It is a beautiful little insect, but sometimes quite destructive. It gathers together the leaves and, folding them, feeds on their substance. It can easily be kept in check with the use of a little hellebore and water.

“There is a saw-fly also, called the strawberry false worm—*Emphytus maculatus*, which destroys the leaves during the month of June. The larva approaches maturity about that time and eats holes in the leaves. This insect can also be controlled by the use of hellebore. There is a strawberry bug—*Corimelana*—a small black insect that looks very much like a beetle, with a shining surface. I have had no personal experience with it, and I merely mention it as one of the insects which occasionally injure the strawberry. On the whole, I consider the strawberry less troubled with insect enemies than any other fruit we cultivate.”

Insects Injurious to the Grape.

The grape vine insect pest that comes first of all to the mind is the Phylloxera. There does not appear to be any sufficient evidence that it has yet done mischief to the vines of Canada, although terribly destructive in France and also very injurious in some parts of the United States. Mr. Charles Arnold, of Brant, asserts that he has detected the Phylloxera on his vines. He says:—

“There is a disease affecting my vines which I think is the phylloxera. The roots are injured by something early in the fall, but the insects are so small that I cannot catch them. The young roots look as if the outer skin was all eaten off. I have never endeavoured to find out what the insect was by sending samples of the roots to experts, because I was not suspicious of it before, but I shall do so this fall. . . I have compared the accounts of the operations of the phylloxera elsewhere with my own experience, and the comparison leads me to believe that the insect to which I have referred is that insect. My crop of grapes under glass is also injured. The phylloxera attacks both root and leaf. It was only last fall when I suspected its presence.”

The opinion of Mr. Arnold that the injury or disease he speaks of is due to the phylloxera, is not shared by other witnesses.

Mr. Beadle speaks of it as follows:—

“Unfortunately in Europe they have imported an American insect that is laying waste the vineyards there with terrible destruction, the grape louse or phylloxera. It is believed by naturalists that it has two forms, one feeding on the leaves and the other on the roots, I have seen the leaf form on my own grounds but not for several years. In some parts of the United States this insect has been prevalent and vineyards have suffered from them. In some parts of California it has been a serious detriment. There are some varieties of our native grapes which are thought to be proof against it. When I say that it has two forms I mean that it attacks the leaves and the roots at different stages of its growth. . . I don't think the injury to the vine is serious so far as they affect the leaf, it is only when they attack the root that the vineyard is destroyed. We do not suffer to any appreci-

able extent in Canada from the insect which I spoke of as having been imported into Europe from America, but I believe they do in some parts of California."

A very excellent illustration of the insect in its various stages of existence, and of specimens of its handiwork, are shown in the accompanying plate. (See Figs. 67 and 68.)

Mr. Bethune speaks of it as follows:—

"The *Phylloxera vastatrix*, which has proved so destructive to the vineyards of France, belongs to the same tribe as the plant lice. There are two varieties, one 'gall-inhabiting,' that is making excrescences upon the leaves of the vine, the other attacking the root.

"At first these were thought to be separate species altogether, entirely different as they are in habits, and differing also in appearance, but Prof. Riley demonstrated, what had been suspected by some French entomologists, viz., that they were merely two forms of the same creature, and that the insect had two different modes of life. It has been enormously destructive in France, and has done considerable damage in some parts of the United States, but no injury of any account has been traceable to it in Canada.

"The gall-inhabiting variety is common enough here, but this form of the insect is comparatively harmless. One peculiarity of this variety is, that they are all females, while those which attack the roots are both wingless females and winged males and females.

"The males appear in August and September for the purpose of propagating the species. In the following year the insects attack the soft fibrous roots of the plant, causing them to swell and gradually rot away. The plague was at first supposed to be a rot on this account. The insects of course extract from the roots the juices which should go to the nutriment of the plant, thus giving the leaves a sickly appearance, which is usually the first indication of the presence of the pest.

"When the work of destruction is pretty nearly finished, during the last years of the plant's life, the insects entirely disappear, and it was for this reason that it was so long before the insect was discovered.

"The only efficient remedy against the root form is drenching with water. In Europe, the vineyards are mostly situated on hillsides, so that there is great difficulty in applying this remedy. On level plains, however, a mode of irrigation on a large scale has been introduced. Water is let into the vineyards during the autumn and winter months, and let away in the spring, no permanent injury being done to the plants. The simplest remedy for the gall-inhabiting form, is to pick the leaves off and burn them.

"The gall form attacks the Delaware and Clinton grapes, and the root form the Delaware, Hartford, Isabella, and Creveling. The Concord is attacked, though very slightly, by both forms. Our climate is too moist for the comfortable existence of the root form, and even if the grape should come to be much more extensively cultivated in this country than at present, I think our climate would grant us immunity from this pest."

The Green Grape Vine Sphinx, *Chærocampa pampinatrix*, is a large green caterpillar, striped at the sides with whitish stripes, and has a horn at its tail. If uninterrupted it will completely strip the vine of its leaves. Its presence is easily detected. Hand picking is the simplest artificial remedy. (See Fig. 69.)

INJURIOUS INSECTS.

THE PHYLLOXERA—*Phylloxera vastatrix*.



Fig. 67—Grape Vine Leaf attacked by Phylloxera.

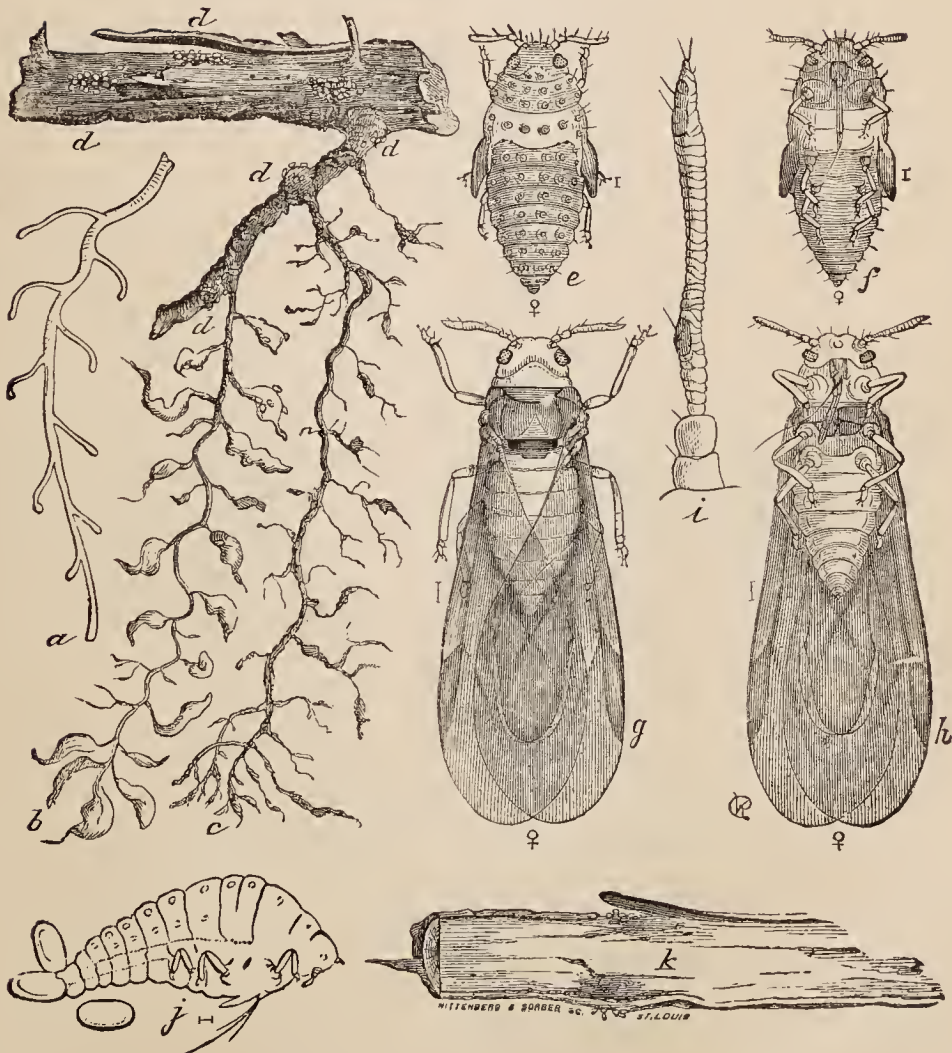


Fig. 68.

Fig. 68.—Showing the insect in its different stages of growth ; also a diseased vine root.



INJURIOUS INSECTS.

THE GREEN VINE SPHINX—*Choerocampa pampinatrix*.



Fig. 69.

THE WOOD NYMPHS—*Eudryas grata* and *Eudryas unio*.



Fig. 70.



Fig. 71.

THE LARVÆ AND EGGS OF EUDRYAS UNIO.

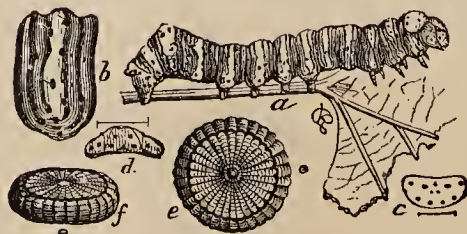


Fig. 72.

Two small moths, one called the Beautiful Wood Nymph (*Eudryas grata*), and the other the Pearl Wood Nymph (*Eudryas unio*), also attack the grape vine foliage as well as that of the Virginia creeper, although they prefer the grape. (See *Figs. 70 and 71.*) Mr. Saunders describes them as follows :—

“In both the ground colour is creamy white, and the rest a rich brown shading. They are active only at night. During the day-time they rest on the grape-vine foliage, and are often found with their wings closed, sloping like the roof of a house, and their fore legs extended and tufted with large tufts of hair, presenting a very peculiar appearance for a lepidopterous insect. In this way they rest, not unlike a patch of the droppings of birds, and on this account seem to obtain that exemption from foes which is desirable for their preservation.”

The larva and eggs of *Eudryas unio* are represented in the illustrations. (See *Fig 72.*) The larva is about an inch and a half in length, and is variously covered with red, black, and green markings. They riddle the grape leaves very severely.

The Grape Cidaria (*Cidaria diversilineata*), one of the geometer family, and the common woolly bear (*Spilosoma Virginica*), are also mentioned as injurious to the grape vine.

The Grape Vine Leaf Roller (*Desmia maculalis*) and the Grape Vine Plume Moth (*Pterophorus periscelidactylus*) also attack the grape-vine leaves. (See *Figs. 73 and 74.*) They are described as follows :—

“The plume moth feeds on the vine very early in the season, just as the foliage is expanding, and at that time it does as much execution as a much larger species will when the foliage is more fully developed. It riddles the leaves and sometimes destroys the fruit to some extent.

“The grape-vine leaf roller is a pretty little dark brown or black moth with two white spots on each of the hind wings. In the larval staté it makes a little case of the leaf by rolling and stitching it up, and it is so active that it pops out of one end of the case thus made before you can catch it at the other. These are all the insects that seriously affect the leaves. There are some beetles, however which attack the leaf.”

Hellebore and water, or if they are very tenacious of life, as in the case of beetles, a little Paris green and water, will effectually dispose of them, as well as most insects to which it is safe and convenient to apply it.

The Spotted Pelidnota (*Pelidnota punctata*) is a large red coloured beetle, and very common on the grape vine. (See *Fig. 75.*) Its larva lives in decaying wood.

The Grape-vine Flea Beetle (*Haltica chalybea*) has recently been very mischievous. (See *Fig. 76.*) It attacks the buds just as they are swelling, and although only some three-twentieths of an inch in length, will, says Mr. Saunders,

devour a bud containing three or four bunches of grapes at a meal. If numerous it will soon dispose at this rate of a large crop of grapes. Its history is as follows :—

“The beetles that appear in early spring are those that have hibernated in the rubbish and decayed leaves at the base of the grape vines, or in their immediate neighbourhood. After they have fed a while on the expanding buds, and as soon as the leaves of the grapes begin to form, they deposit their eggs on the leaves, and in time these hatch into small black larvæ with six feet, which begin to feed on the foliage, riddling and devouring it very much in the early period of its growth. These larvæ are usually quite numerous, and continue feeding on the vine for some weeks. When they attain their full growth, they descend to the ground and enter the chrysalis state, where they remain till the autumn, when the beetles escape from the chrysalis and hibernate in rubbish, and among the dead leaves.”

The best method of dealing with so dangerous a pest has been much discussed, and a useful suggestion on the subject is given by Mr. Saunders, who says :—

“Some difficulty has been found in killing this insect. During the past year the Entomologist of the Department of Agriculture, at Washington, has been conducting a series of experiments with the view of devising some expeditious means of catching and killing this insect, and the most useful plan he could suggest, after many experiments, was to thoroughly saturate a strip of cotton, three by six feet, with kerosene oil, and hold it under the vines while they are being jarred. The beetles fall by the jar, and the kerosene kills them. They are rather torpid in the early part of the day, especially in the cool of the morning, and if the vines are visited at that time, and the screen put underneath them, they can be readily shaken down, and destroyed. By keeping the neighbourhood of the vines quite clean and free from rubbish, and not affording these insects any hiding places, you can lessen their numbers very much, since unless they have a place in which to hibernate they are more exposed to their enemies, and will probably leave the neighbourhood and look for shelter elsewhere.”

The Rose-beetle (*Macrodactylus subspinosus*) “is about half an inch in length, with long spreading legs, and of a brownish colour, and devours the leaves very rapidly. In the larval state it is found eating the succulent roots of plants and grasses. It deposits its eggs in a cavity in the earth, and when the larvæ complete their growth they enter into the chrysalis state in the ground and the next season produce this beetle which is so destructive.”

The Thrips, so called although the true thrip is quite a different insect, are members of the bug family, small in size and partial more particularly to the thin-leaved varieties of grape. (See Fig. 77.)

“They are all supplied with beaks, or rostrums with which they pierce the leaves and, sucking the sap, produce small white dots upon them, and when the insects are very numerous they soon affect the entire leaf, so that it withers either partially or wholly, and the vine presents a very diseased appearance, while for want of proper foliage the fruit fails to ripen as it should, and hence the crop is very much injured.”

INJURIOUS INSECTS.

THE GRAPE VINE LEAF ROLLER—*Desmia maculalis*.

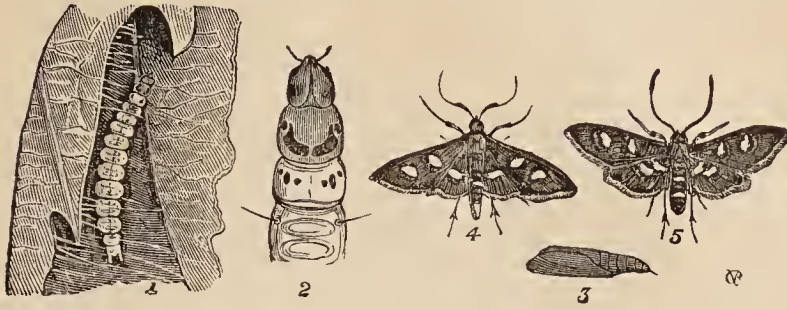


Fig. 73.

Fig. 73, shows both moth and caterpillar of this species.

GRAPE VINE PLUM MOTH—*Pterophorus periscelidactylus*.



Fig. 74.

THE SPOTLED PELIDNOTA—*Pelidnota punctata*.

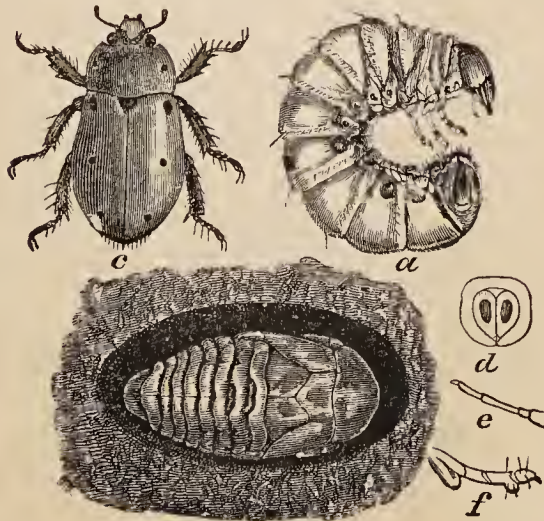


Fig. 75.

INJURIOUS INSECTS.

THE GRAPE VINE FLEA BEETLE—*Haltica chalybea*.



Fig. 76.

In *Fig. 76* the beetle is shown at *d*, the larvæ at *b*; *c* is the chrysalis; while *a* represents a leaf partly eaten by the worms.

THE THRIPS.



Fig. 77.

Fig. 77 shows one of the commonest forms, with wings both closed and expanded.

THE TREE CRICKET—*Ecanthus niveus*.



Fig. 78.



Fig. 79.

Fig. 78 represents the female, and *Fig. 79* the male insect.

In its earlier stages of growth the insect may be destroyed by syringing the vines with an alkaline solution, but as it becomes older it resists such mild appliances. Building fires at night to attract the insects has been tried, and it has been suggested that jarring the vines by torch-light might be efficacious. The insects would, it is said, be disturbed by the jarring, and fly to the light and be burned.

The tree cricket (*Ecanthus niveus*) attacks both grape and raspberry. (See Figs. 78 and 79.)

"The female is furnished with a very characteristic ovripositor for placing her eggs. She has a saw-like apparatus, by means of which she is enabled to saw through the wood with ease. She sits on the cane and saws a slit large enough to contain an egg, which is placed in it. Then moving a little she saws another slit, and deposits another egg, and so on, until a straight row of eggs have been laid about an inch or an inch and a quarter in length. This series of slits in the cane weakens it very much, and during the winter those eggs deposited in that manner are preserved from change of temperature and from destruction by birds and other insects that might prey upon them. The insect does not feed upon the vine or the vine leaves, but the presence of these eggs weakens the stem mechanically to such an extent that when the foliage expands in the following season the weight of it sometimes breaks the stem, and thus the crop is lost."

The Grape Seed insect (*Isosoma vitis*), a minute fly, deposits its eggs on the outside of, or just under the skin of, the grape. The larva enters the seed while in a soft green state, and feeds on the kernel. The grape is thus prevented from ripening, and the presence of immature green grapes in a bunch is accounted for.

The last mentioned insect enemy of the grape is the honey bee. Of this insect Mr. Saunders says:—

"The Honey Bee (*Apis mellifica*) has been accused of injuring the grape crop, and, I believe, with a good deal of justice. During this past season, in the neighbourhood of St. Catharines, several parties have lost almost their entire crop from this pest. Mr. Rykert, who has been one of the sufferers, tells me that he has watched and seen them attack the sound grapes, bite through the skin, and proceed to extract the juice. The only way in which he could save his grapes, was by covering them with netting. Mr. Taylor, of St. Catharines, who is a large grape grower, has also complained much of this trouble."

Insects Injurious to the Squash, Melon and Cucumber.

"A small wasp-like creature," the Squash Vine Borer (*Aegeria cucurbitæ*) is in its larval state, highly destructive to the squash. The moth is harmless. (See Figs. 80 and 81.)

The Striped Cucumber Beetle (*Diabrotica vittata*) is more destructive than the squash vine borer, and continues its depredations in the beetle as well as the larval condition. Both these pests direct their attacks to the stem of the plants,

sucking the juices and effectively destroying the plant, if not arrested. The best remedy appears to be to enclose the young plants in small boxes with gauze tops, until they have so far developed as to resist successfully the attacks of the beetles.

Of the squash bug, Mr. Saunders says:—

“The squash bug (*Coreis tristis*) is another insect very destructive to the several varieties of the squash. It belongs to the order hemiptera, the true bug family, and has a very unpleasant odour when handled. This creature injures the vines by puncturing them and sucking the sap, and it lays its eggs in considerable quantities on the under side of the leaves. These hatch, and the colony of squash bugs which result will pass from leaf to leaf, and very soon the vine becomes sadly disfigured, and the foliage so injured as to prevent its normal growth, and an attack from this bug will often result in a partial or complete loss of the crop if the insect is allowed to proceed unchecked. From the fact of the insect living altogether by suction, it cannot be reached by hellebore or Paris green or other poisons of that class. It may, however, be affected by syringing the vine with alkaline solutions, and it has occasionally been subdued to a certain extent by pouring hot water on the vines, which will usually dislodge the insects, and if hot enough, destroy them.” (See Fig. 82.)

The Cucumber Flea Beetle (*Haltica cucumeris*) is not so plentiful as to do much practical injury.

Insects Injurious to Forest Trees.

With increased attention to the study of Forestry, the services of the Entomologist will be more frequently called into requisition in connection with the insect destroyers of forest trees. They are not less numerous or destructive than those which attack the grain fields or orchards.

The Wood-borer is the species of insect most mischievous in its operations, and the name covers a numerous family.

Of the pine borers the largest is known as *Monohammus confusor*. “It is remarkable,” says Mr. Bethune, “for the enormous length of its antennæ, or horns, which extend sometimes to twice the length of its body, the latter being probably an inch and a half long, thus making the antennæ three or four inches in length. They are, besides, curiously jointed and form a curve usually branching out on each side.”

Its history and habits are described as follows:—

“The insect is produced from a very large grub, of a whitish colour, with a large broad head and very powerful jaws, with which it cuts into the timber of the trees. It is not a very common insect in this part of the country, but in the Ottawa lumber districts, and in the lumbering regions north of Peterborough, it has frequently been very abundant and very destructive. Its habit is to attack timber that has been injured, usually by fire, or blown down by the wind; it does not attack green, flourishing timber. It frequently happens that forest fires will sweep over a number of square miles of timber during one summer. If the fallen

INJURIOUS INSECTS.

THE SQUASH VINE BORER—*Egeria cucurbitæ*.



Fig. 80.

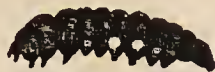


Fig. 81.

THE SQUASH BUG—*Coreis tristis*.



Fig. 82.

A MAPLE BORER—*Clytus speciosus*.



Fig. 83.

ORTHOSONA CYLINDRICUM—BEETLE AND LARVA.



Fig. 84.

or injured timber is not cleared away the same summer it is liable to be destroyed by this beetle. In the following spring the parent beetles frequent this burnt district and lay their eggs on the trunks of the trees which remain standing. From these eggs hatch out the grubs, which gradually penetrate into the interior, and burrow long chambers through and through the tree. Where they are very numerous they will honeycomb the wood to such an extent as to make it quite useless for building purposes. Consequently, in the Ottawa region particularly, it is a race between the lumberers and beetles as to which shall secure the timber after a fire has scorched a district. It is also very destructive to timber that has been cut and left in the woods as saw logs, though in this case stripping off the bark is a remedy."

The damage done by this pest, in some instances, has been enormous, one timber-limit owner having, in a short time, it is said, lost over \$150,000 by its ravages.

The *Monohammus scutellatus* is another borer, more numerous than the previous one, is black in colour, slightly spotted with white, while *Monohammus confusor* is an ashen gray. The habits of both are similar. The grub of the *scutellatus* frequently arrives at maturity in the timbers of newly erected buildings, to the great astonishment of the occupants.

Chalcophora liberta and *virginica* are also woodborers of a metallic cast of colour and burrowing, like the others already named, in the timber.

A maple borer (*Clytus speciosus*) is velvety black in colour, with bright-yellow stripes and markings. (See Fig. 83.)

The locust-tree borer (*Clytus flexuosus*) is more wasp-like in shape and very destructive to the tree with which its name is identified. Mr. Bethune thus alludes to its habits:—

"Some years ago it was very abundant in the neighbourhood of Toronto, and killed most of the locust trees from Toronto to London. I have also found immense numbers about the Credit and other places, but now, I think it has to a large extent disappeared.

"When it attacks a tree, little masses of what looks like sawdust may be seen in the forks, at the base, or adhering to the bark. These are the fragments of the wood which the grub casts out during his borings. Swarms of flies and other insects attracted by these castings also betray the presence of the borer.

"It may be killed by inserting a wire into the hole which it has made in the tree, but a more effective remedy is the application of very strong soap-suds to the stems and branches, especially when the attack is first noticed. As the beetle gets older and stronger it penetrates more deeply into the tree, and is not so easily reached. This treatment would prove equally effective in the case of the maple-tree borer."

A large chestnut-brown beetle (*Orthosoma cylindricum*) of the same family as the *Monohammus* is also noticed. It is well known as a frequent intruder into houses when lighted at night. It is more generally diffused than the *Monohammus*, which is found chiefly in the lumbering regions. (See Fig. 84.) Of the habits of the pine borers Mr. Bethune adds :—

“The presence of these large pine borers can generally be known by the noise which they make while at work. On a still night the crunching of their jaws can easily be heard at a distance of several rods, and by listening intently, the exact spot can be found where the creature is hard at work. Most of these large borers attack only trees that have met with some injury, whether from wind or fire, but the *Clytus* borers will attack perfectly healthy trees.”

Of other enemies of forest trees, Mr. Bethune says :—

“There are a number of other insects which attack the wood of our forest trees, such as those of the *Scolytus* family, and others, but they are smaller in size, some of them being very minute indeed. They chiefly work just beneath the bark of the tree, and I do not know that they do any great amount of damage. Some of them penetrate the small twigs and shoots, and do injury in that way. They do not, as a rule, attack live, healthy trees, but if the bark has become loose from any cause, they are apt to get under and damage the wood.”

BENEFICIAL INSECTS.

Entomology is a branch of natural history so little studied that it is not wonderful there should be a very great confusion of ideas as to the precise position of the insect races in nature's economy. People generally regard all insects as pests, destroy them indiscriminately, and feel that they are doing precisely the right thing when they even legislate,—as they think—so as to promote or ensure their destruction. But enough is known by those who have cared to investigate, to show that the insect world deserves no such wholesale condemnation, that there are insects as beneficial as others are injurious, and that it is not to the rather problematical offices of birds, or even the ingenuity of man, but to the tiniest of living creatures we must often look for protection against known insect enemies. When Mr. Brodie in his evidence remarks, “Over 5,000 species of insects are known to science, a large proportion of which prey on plant-eating insects;” and, “every entomologist is acquainted with some portion of the life-history and habits of the more common species, and knows that their hardiness, fecundity, and their ability to keep in check the species on which they prey, are very remarkable,” he is only claiming to know what has been ascertained on the mere threshold of this branch of discovery and investigation. Mr. Bethune in his evidence says :—

“I think it would be very desirable if the community in general were able to distinguish between insects that are really beneficial and those that are really in-

BENEFICIAL INSECTS..



Fig. 85.



Fig. 86.



Fig. 87.



Fig. 88.



Fig. 89.



Fig. 90.

Fig. 85.—The common tiger beetle (*Cicindela vulgaris*). *Fig. 86.*—The purple tiger beetle (*C. purpurea*). *Fig. 87.*—The hairy-necked tiger beetle (*C. hirticollis*). *Fig. 88.*—The six spotted tiger beetle (*C. sexguttata*). This last is a most beautiful insect, of a brilliant colour. *Fig. 89.*—The large tiger beetle (*C. generosa*).

CALOSOMA SCRUTATOR.

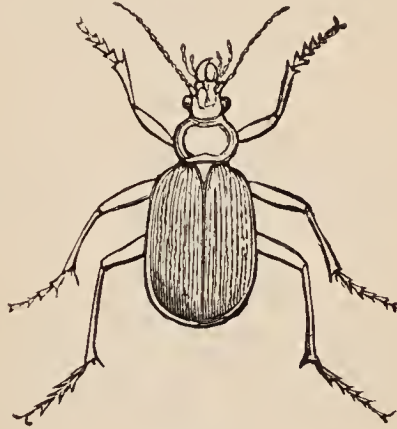


Fig. 91.

WATER BEETLES—SEVERAL FAMILIES.



Fig. 92.

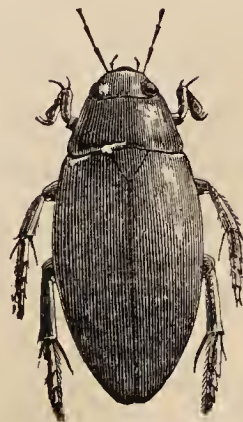


Fig. 93.

Fig. 92 represents the largest of our species of *Dytiscus* (*D. Harrisii*).

Fig. 93. A species nearly as large, *Hydrophilus triangularis*.

jurious. Most people will trample under foot any insect they come across, particularly if its appearance is not very inviting, and numbers of those that are put to death in this way are our very best friends."

Mr. Saunders, at the close of his evidence, says:—

"I am quite satisfied that we have to look to the insect world to control that part of the insect world which is destructive to our crops."

The numerous allusions in the evidence just reviewed on the subject of beneficial species have been passed over till now, in order to present more forcibly and effectively when grouped than separately, the enormous benefits the friendly species confer on mankind.

The beneficial insects are divided by entomologists into four or five classes. First come the Tiger beetles, or *Cicindelidæ*, handsome creatures, the larvæ of which, living in holes in a dry sandy soil, feed exclusively on insect prey. The perfect insect has great powers of speed and activity on the wing, and also lives exclusively on insects. (See Figs. 85 to 90.)

Next come the ground beetles, living under stones and rubbish, and especially active in destroying the larva of the potato beetle and various kinds of caterpillars.

"The genus *Harpalus*," says Mr. Bethune, "is especially valuable in this way. Some of them are large and handsome. Then there is the genus *Colosoma*, of which there are two or three species, one of them being a large beautiful green beetle called the 'caterpillar hunter,' from its habit of going up trees, and seizing upon and devouring caterpillars. We do not know a very great deal about the habits of these insects. This year I found the large *Colosoma scrutator* (see Fig. 91) as well as the *Colosoma frigidum* very abundant at Port Hope. Another species called the *Colosoma culitum*, also a large and handsome beetle, destroys a great number of caterpillars and noxious insects."

All these live exclusively on insects, and unlike many species of birds, take no toll by levying forced contributions on our fruit trees for their services.

The water beetles come next, living in the water, feeding solely on insects, and keeping such insects as the mosquitoes, and others bred in the water, in check. (See Figs. 92 and 93.)

The scavenger beetles are useful in another way. (See Fig. 94.) Mr. Bethune says of them:—

"Then we have some insects that are indirectly beneficial, such as the families *Silphidæ* and *Staphylinidæ*, which act as scavengers. The former live upon carrion, and some of them have the very useful habit of burying small dead animals, not, however, with the object of removing the offensive objects from our sight, but of laying their eggs in them, and thus providing food for the grubs which are thus

hatched out. Others feed upon dead fish thrown up on the shores of our lakes and rivers. The *Staphylinidæ* have much the same habits, but they live upon decayed vegetable as well as decayed animal matter."

Mr. Bethune also classes among beneficial insects the *Scarabæidæ*, but there are members of this family that are destructive to vegetation. Several of them feed exclusively upon the droppings of animals, and other refuse.

The family of the *Lampyridæ*, to which the fire-fly belongs (which is, by the way, not a fly properly so called, but a small beetle), come next in order. One of this species, the *Chauliognathus pennsylvanicus*, as represented by its larva, feeds on the plum curculio. (See Figs. 95 and 96.)

Then come the Lady Birds or *Coccinellidæ* which, both in their larva and perfect state, live upon the eggs of the Colorado beetle, upon plant lice, and other minute pests.

The *Ichneumons* play a very important part in the war between the beneficial and injurious species. (See Fig. 97.) Mr. Bethune says of them :—

"The next order of beneficial insects is the *Hymenoptera*, the family to which bees, wasps, and most of the stinging and piercing insects belong. It is not necessary to speak of bees as being beneficial, but I wish to say a few words as to the *Ichneumons*, which belong to this order. There are hundreds of different kinds of these insects varying in size from several inches in length down to a degree of minuteness that can scarcely be seen with the naked eye; but all prey upon other insects.

"The perfect four-winged fly lays its eggs in the bodies usually of the caterpillars of all sorts of insects, and the young larvæ burrow into the living grub and gradually kill it. It is to these ichneumons, more than to any other cause whatever, that we owe our immunity from the ravages of destructive insects.

"We have found at various times, that as soon as they became abundant, the pests were almost entirely exterminated, while, if they happened to be rare, the noxious insects thrived in spite of all other checks. Some of the largest of the kind, with ovipositors three or four inches in length, will penetrate the thick bark of trees and fasten upon their prey. They are extremely numerous, and I suppose every species of insect has its own ichneumon feeding upon it and keeping it down. Wasps and hornets may be looked upon as partly beneficial and partly injurious. The large black hornet, with the white face, kills a good many house-flies."

Following these come the order of *Diptera* or two-winged flies, including the syrphus fly, the enemy of the apple-tree root louse, and the tachina flies. The distinction between these flies and the ichneumon is that, while the former have only two wings the ichneumons have four. (See Fig. 98.)

Of the habits of the two-winged flies, Mr. Bethune says :—

"Their eggs are laid in the bodies of caterpillars, which the larvæ thus

BENEFICIAL INSECTS.

COMMON SCAVENGER BEETLE—
Necrophorus velutinus.



Fig. 94—One of our commonest species.

A CURCULIO DESTROYER—
Chauliognathus pennsylvanicus.



Fig. 95.



Fig. 96.

AN ICHNEUMON—*Macrocentrus delicatus.*

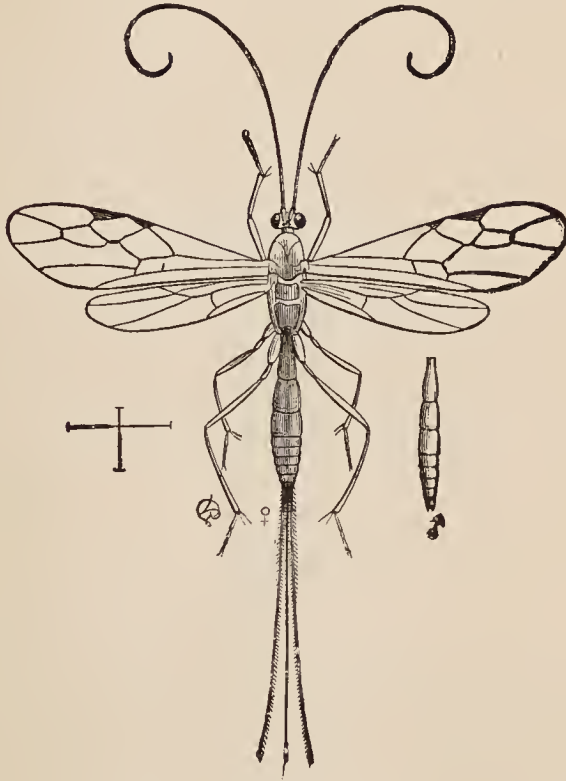


Fig. 97.

Fig. 97 shows one of the parasitic Ichneumons which destroys the codling worm of the apple.

A TACHINUS FLY.



Fig. 98.

hatched out gradually kill. The mosquito may also be considered, in one sense, a beneficial insect. Its larvæ live in water, and feed upon decaying organic matter found there. It is probably of assistance in reducing the amount of miasma in marshy places."

Some of the species belonging to the family *Hemiptera* are beneficial, while a large number are injurious. Some of the carnivorous bugs belonging to this order destroy a large number of insects, and among others, the Colorado beetle in its larval state.

We then come to the order of *Neuroptera*, including the dragonflies. (See Figs. 99, 100 and 101.) Of these Mr. Bethune says:—

"The last order I need refer to is the *Neuroptera*, to which belong the handsome dragonflies. These insects, in their larval state, live in the water, and are very ferocious, destroying a large quantity of the larvæ of other insects; while, in their perfect condition, they fly about and kill great numbers of flies that are the parents of injurious insects. Notwithstanding the fact that they are promiscuous feeders, and perhaps prey upon some of the ichneumon flies, I think they may be classed as decidedly beneficial.

"The lace-winged flies, to which I referred as feeding upon plant lice, belong to this order. The perfect insect is very beautiful in appearance. Its wings resemble very fine lace, the body is green, and it has large prominent golden eyes, but unhappily it also possesses a very offensive odour. It deposits its eggs upon stems that are entirely out of proportion to the size of the eggs it lays, and which maintain them in an elevated position above the surface of the leaves or twigs on which they are deposited."

Mr. Bethune finally alludes to the spider family, and vindicates them from some popular misconceptions. He says:—

"Spiders, though not properly termed insects, are highly beneficial. They belong to the group *Arachnidæ*, and are of the same class as the scorpions and some other creatures of that kind. They destroy a large number of insects, mostly of the winged classes, though the more predacious spiders, that do not construct webs, prey upon other insects as well. The common web-spinning spider, though a source of annoyance to the tidy house-keeper, is of very great use in despatching house-flies and other insects, while, notwithstanding the stories which are told us to the contrary, it is not at all poisonous or injurious."

It will be interesting now to turn to the evidence of the work of beneficial insects in particular cases. Mr. Brodie mentions several very important services rendered by them within his knowledge. He says:—

"Among many reported instances of injurious insects being brought to zero by parasites may be mentioned that of the swallow-tail butterfly, the larvæ of which in the summer of 1876 did considerable injury to celery, parsley, and other umbelliferous plants in the vicinity of Toronto. In 1877, the ichneumon, which preys on them—*Trogus exesorius*—became common, and gained on them, so that this last summer a large field could be searched without finding a larva.

"From 1865 to 1870 the larvæ of the *Apatela americana* did serious injury to the horse-chestnut trees in and around Toronto; many of the trees were

nearly denuded of leaves, and in the pupating season 100 larvæ could be collected in a morning walk down Queen street avenue; in the fall of 1870, two species of parasites—an *Ophion* and a *Tachina*—were found preying on them, and so speedily did they increase that in a large collection of *Apatela* larvæ collected in the autumn of 1879, 96 per cent were found to be parasitized."

A similar instance in regard to the *Cecropia* in the cocoon state has been already mentioned.

In Mr. Bethune's evidence reference is made to the existence of a friendly parasite to which he ascribes largely the diminution in numbers of the wheat midge. He says:—

"I am inclined to ascribe the diminution in numbers, in fact, the almost total disappearance, of the insect, in part to the work of parasites, although we have not discovered any specimens, as they would in all probability be even more minute than the insect itself.

"In England, it is well known that there are parasites which attack the wheat midge, and much surprise was expressed, at the time its ravages were so great in this country, that we did not experience the benefit of parasites in the same way that the farmers of England and the continent had."

With praiseworthy zeal, Mr. Bethune opened a correspondence with Mr. Francis Walker, of the British Museum, a well-known entomologist. He says:—

"My idea was that it would be worth while, if possible, to import these parasites from England, breed them here, and so set going one of the natural and most efficacious checks upon the ravages of this creature. Mr. Walker stated that there were, at least, two well-known parasites—chalcis flies—that preyed upon the wheat midge in England, but he said it would require the attention of a thoroughly scientific entomologist for several months, together with great care and labour, to obtain these creatures. The danger of making a mistake would be very great, as also would be the difficulty of getting them out at a proper time, but he thought it could be done. My own impression was the same; and I wrote upon the subject at the time in the *Canada Farmer*, and was about to bring the matter before the notice of the Legislature, but just then the midge began to cease its attacks upon the wheat, and it did not seem to be a matter of any further consequence."

Of the Hessian fly the same witness remarks that it is preyed upon by numerous parasites, minute chalcis flies, various ichneumons, and some more properly termed bugs. And referring to its almost entire disappearance for a long interval, he says:—

"We owe, however, infinitely more to the work of parasitical insects than to any other cause whatever, for the keeping down of insect pests. That, at any rate, is my opinion, and it is one which I have formed on actual observation and long experience."

The chinch bug, terrible to the Western States farmer, although unknown as a danger here, is preyed upon by lady-birds, lace-winged flies and syrphus flies (*See Figs. 102 to 110*).

BENEFICIAL INSECTS.

DRAGON FLIES.



Fig. 99.

Fig. 99.—In this figure we have represented the larva in the act of capturing its prey, and the pupa case, with the perfect insect just emerging therefrom.



Fig. 100.



Fig. 101.

Fig. 100 shows one of our most common Dragon Flies (*Libellula trimaculata*), and Fig. 101, *L. quadrimaculata*.

The grain-aphis and others of the *Aphidæ* are devoured by millions by insects, chiefly of the last named varieties.

What the lace-winged flies and lady-birds do in reducing the numbers of the Colorado beetle, has already been noticed. To these enemies of that pest may be added the soldier bug, and some others of the carnivorous beetles. (*See Figs. 111 to 114.*)

Of the foes of the grasshopper, Mr. Bethune says:—

“A very large number of parasites prey upon our common grasshopper. One of these is a very peculiar creature, commonly called the ‘hair-snake,’ sometimes seen in water. This feeds upon the interior of the body, and fatty parts of the grasshopper, and I have no doubt keeps its numbers down to a very considerable extent.”

Mr. Brodie says:—“The best known parasite that preys on the grasshopper is a *Tachina*.”

The Phylloxera is also kept in check by lace-winged flies, lady-birds and syrphus flies.

The two butterflies, *Grapta comma* and *Grapta interrogationis*, enemies of the hop plant, are also checked by an ichneumon. Of this little creature Mr. Bethune says:—

“The butterflies are very subject to the attacks of a parasite, a small ichneumon which lays its eggs in the caterpillar, and the grub hatched from these feeds upon the fatty portions of the caterpillar as long as it lives. After the caterpillar is transformed into a chrysalis and suspended in the usual manner, the grub completes its work of eating it up, and finally makes a hole through the shell of the chrysalis, coming out a little black fly. These are so common that, as a rule, the chrysalids that one gathers produce ichneumons rather than butterflies. Though these butterflies lay a large number of eggs, they are never liable to be a serious pest, on account of the checks imposed by these ichneumons.”

The very serious mischief attendant upon the introduction of the cabbage butterfly and its fearfully rapid spread over a large part of this continent have been alluded to. To what is the diminution of its numbers due? The evidence of Mr. Bethune and Mr. Brodie supplies the answer.

Mr. Bethune says:—

“Its (the cabbage worm’s) first attack in any locality is generally excessively severe, almost entirely destroying the crop of cabbages and cauliflowers. In about two years, however, its numbers gradually diminish, until it becomes only a moderate pest, as it is with us now.

"This diminution is entirely owing to the work of a minute parasite, an ichneumon, called *Pteromalus puparum*. This insect is very familiarly known in England, where it keeps the butterfly down, so that it is never very seriously destructive, except in occasional years, as in the case of most other insects. It carries on its operations in precisely the same way as the parasite I have described as attacking the hop butterflies, completing its destruction when in the chrysalis form, and emerging therefrom in the shape of a minute winged fly."

Mr. Brodie says :—

"Among the Lepidoptera, which have done marked injury to farm crops in the county of York, during the last thirty years, may be mentioned, the cabbage butterfly—*Pieris rapæ*—now nearly exterminated by an ichneumon, *Pteromalus puparum*."

Of the root plant louse's enemy, Mr. Saunders says :—

"This insect is preyed upon by a species of syrphus fly—*Pipiza radicum*—which lays its eggs on the roots, and the larvæ which are hatched feed freely upon the lice." (See Fig. 115.)

After mentioning his ill success in his attempts to discover tent-caterpillars in the stomachs of birds, only one—the cuckoo—being found to be feeding on them, Mr. Saunders goes on to say :—

"In rearing them (the larvæ), however, I found that a very large number, after the first year, produced parasitic insects ; one species of tachina, and two species of ichneumons, being very abundant. I have no doubt that these parasites did more towards destroying the caterpillars than any other cause."

"From 1870 to 1873," says Mr. Brodie, "the Tussock-moth (*Orgyia leucostigma*) was very common in and around Toronto, Owen Sound, and other parts of Ontario ; the larvæ, feeding on the leaves of the horse-chestnut, maple and elm, did serious injury to these trees. They have been reduced by an ichneumon—a species of *Pteromalus*—so that during the past summer I have not seen one specimen."

Again, of the *Cecropia*, Mr. Saunders says :—

"A large number of parasites feed upon the *Cecropia*, and it is quite common to find that, out of a number of cocoons from which you are expecting moths, the larger proportion produce nothing but ichneumons. In this way I presume the insect is kept very much in check, and it is very seldom present in sufficient numbers to defoliate a tree unless the tree is young."

The codling worm has its parasites, but they do not seem, so far, to be equal to the duty of largely diminishing the increase of this very noxious insect.

The curculio has an enemy in a small beetle, already referred to as one of the same family as the fire-fly. But it has parasites, too, if they can only be secured and set to work upon the abundant army of well-fed destroyers of the plum. Mr. Saunders says :—

"Two parasites have been bred from the curculio, but they have not, so far

BENEFICIAL INSECTS.

LADY-BIRDS, LACE-WINGED FLIES AND SYRPHUS FLIES.



Fig. 102.



Fig. 103.



Fig. 104.



Fig. 105.



Fig. 106.



Fig. 107.

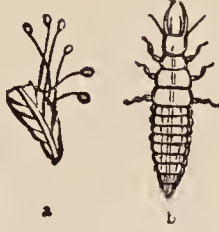


Fig. 108.



Fig. 109.



Fig. 110.

The most common and useful are the different species of lady-birds, four of which are shown by Figures 102, 103, 104 and 105. Fig. 102 is the 13-spotted Lady-bird (*Hippodamia 13-punctata*). Fig. 103 the 9-spotted Lady-bird (*Coccinella 9-notata*). Fig. 104, the plain Lady-bird (*Coccinella mudna*). Fig. 105, the spotted Lady-bird (*Hippodamia maculata*). Fig. 106, shows the larva of one of our common lady-birds. The lace-winged flies (*Chrysopa*) are also enemies of the *aphidæ*, both in their perfect state (Fig. 107), and in their larva state (Fig. 108). The latter figure also shows the curious stalked eggs of this insect. The list also includes the Syrphus flies, shown in the larva state (Fig. 109), and the perfect fly (Fig. 110).

SOLDIER BUG AND OTHER ENEMIES OF THE COLORADO BEETLE.



Fig. 111.



Fig. 112.



Fig. 113.



Fig. 114.

Fig. 111.—The soldier-bug (*Reduvius raptatorius*). Fig. 112.—The glowing calosoma (*Calosoma calidum*). Fig. 113.—The murky ground beetle (*Harpalus caliginosus*). In Fig. 114 is shown a larva of Harpalus, which gives a very good idea of the larvæ of these ground beetles, which may be often met with under stones and stumps in slightly moist places.

as I know, been found in Canada, and only to a limited extent in the Western States. Prof. Riley has bred and described them; they are very small ichneumons. If we could get them it would be very desirable to import them, but they are so scarce in the States, where the curculio is very abundant, and they appear to spread so slowly, and to such a limited extent, that I do not think we have much to hope for from them. The habits of the insect seem to protect it from the attacks of parasites, it being generally imbedded in the fruit while in the larval form, and in its chrysalis state hidden under ground."

The grape-vine sphinx is attacked by a parasite in a peculiar fashion. (See *Figs. 116 and 117.*) Mr. Saunders says on this point:—

"There is one species of ichneumon fly which is very destructive to this caterpillar. The fly deposits a large number of eggs in the larva, and when the larva has attained about two-thirds of its growth it manifests a sickly appearance, and from the inside of its body these parasitic grubs begin to emerge, eating their way through the skin, and spinning their cocoons upon the upper side of the caterpillar, giving it a rather peculiar appearance, so that it has sometimes been taken for a new variety. The larvæ afterwards sicken and die. In this way a considerable number in each year are destroyed. This ichneumon fly is universally found with the worm, and is a very efficient check."

Enough has been said to show in what quarter we must look for help from injurious insects. The cost of the depredations, annually, of the latter, cannot be accurately estimated. It may be reckoned, however, at several millions, and at any moment an increase of some particular pest may work ruin among the farmers or the fruit growers of Ontario.

The Commissioners are strongly impressed with the importance of encouraging every agency calculated to assist in providing against such contingencies, or to promote a more extended popular knowledge of the science of Entomology. The labours of the Entomological Society of Ontario, have been already of incalculable value in these respects, and by means of the *Entomologist*, now nearly completing its twelfth volume, a very large amount of information has been disseminated, and a spirit of inquiry aroused. The Society receives a grant from the Government, gradually increased from \$400 to \$1,000 per annum, "spent," Mr. Saunders remarks in his evidence, "entirely in providing material for carrying on the operations of the Society, the work which is done being gratuitous." The nominal sum of \$100 to cover the expenses of the Editor, and \$50 for those of the Secretary, represent the only personal payments made.

How seriously the people of the United States regard this question, and how highly they appraise the work of entomological experts, may be imagined from the fact that the State of Missouri formerly paid Professor Riley \$3,000 per annum, the Professor now being in receipt of \$5,000 per annum, as head of the United States Entomological Commission, while other officers of that body are paid salaries of \$2,000 and \$3,000 per annum.

The Commissioners recognize the advisability in this, as in other similar matters of utilizing, as far as possible, voluntary and independent organizations, acting in concert with the Government, and relieving the latter of direct responsibility. Nor do they fail to appreciate efforts of a more local character, such as those of the Natural History Society, of Toronto, represented among the witnesses by Mr. Wm. Brodie, which is also doing good service in a very unostentatious manner.

It may be, however, that the time has come for some systematic and concerted action between the Government and our volunteer scientists, in order that we may be more ready than is the case at present, to meet any emergency that may present itself.

Speaking of the services rendered by the United States Entomological Commission, and suggesting that "if the secretaries or other officials of our agricultural societies would make known, at some headquarters, whenever an attack of this kind occurred in their various localities, it would be of great help towards checking it in time,"

Mr. Bethune goes on to say :—

"This, however, would necessitate a Central Office of Entomology, and I would suggest the advisability of the Government appointing a person to take that department in charge just as is done in many of the United States. They have had such an office for many years in the State of New York, and we have found the work of Dr. Asa Fitch, the first incumbent, of the utmost value to ourselves. It is known as a fact that he saved not only the State to which his work was confined but the whole Union millions upon millions of dollars, by the information which he had been able to obtain and disseminate. The States of Illinois, Missouri, New Jersey and Massachusetts have had State Entomologists for several years, and other States have Entomologists in connection with their agricultural colleges who give their attention to the subject. The advantages of the office of Provincial Entomologist would be, that a man could devote his whole time to its duties, and whenever he found that a particular locality was threatened with the attack of any insect, he would at once go there and investigate the matter on the spot, which a person engaged in any other occupation could not do. In this way Prof. Riley, as State Entomologist for Missouri, was enabled to do a great deal of invaluable work, and I think it would be quite worth while for this Province to have an official of this kind. I have no doubt, if sufficient remuneration were offered, that a suitable person—he would of course have to be a thoroughly skilled Entomologist—could be obtained without much difficulty. Even if \$10,000 a year were spent in maintaining an office of this kind, it would be the means of saving hundreds of thousands of dollars to the community in general."

The interests of this Province and a large portion of the Union are so nearly identical in this particular that an exchange of good offices would at all times be both beneficial and natural.

Mr. Bethune, however, rightly points out that "a thoroughly skilful Entomologist" alone, would be competent for such a position. Mistakes might be irretrievably mischievous. Some of the difficulties of the work, and the necessity for great care and accurate knowledge, are suggested in Mr. Bethune's evidence

BENEFICIAL INSECTS.

SYRPHUS FLY—*Pipiza radicum*.

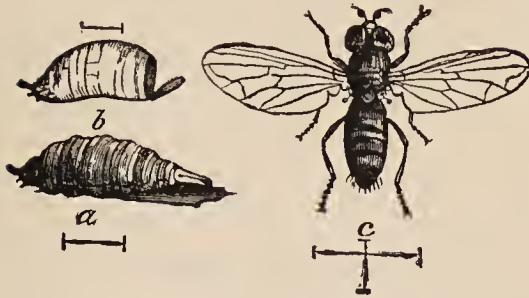


Fig. 115.

Fig. 115 shows this fly with its larva (*a*) and chrysalis (*b*), all magnified.

PARASITE DESTRUCTIVE TO GRAPE VINE SPHINX CATERPILLAR.



Fig. 116.



Fig 117.

The moth is a very handsome creature (*see Fig. 116*), the fore wings of an olive green colour, crossed by bands of greenish grey; the hind wings are of a dull reddish hue. *Fig. 117*, Sphinx Caterpillar attacked by Larvæ.

respecting the midge, and the proposition to import parasitical enemies of that pest. But it will be acknowledged by all, first, that the whole time of a qualified naturalist might well be devoted to this and cognate subjects in the interests of the Province; and secondly, that Entomology should form a prominent and distinct feature, at all events in the curriculum of the Agricultural College, if not elsewhere. It has already been suggested that lectures of a popular character, embracing Forestry, Entomology, and Ornithology, might be profitably inaugurated, and a small hand-book for common use, on either of these questions, would be very acceptable and useful.

At present no work precisely of the character required is in existence. Mr. Saunders says on this point:—

“There are no hand-books on Entomological matters which will compare with the hand-books on Botany, and those of some of the kindred departments of Natural History. The field in Entomology is so wide that it is almost impossible to cover the ground with a single book, as is done in the other sciences. The best practical work, perhaps, which has ever been written on the subject is ‘Harris’ Insects Injurious to Vegetation in Massachusetts.’ It is, in one sense, a scientific work, and treats first of the classification of insects, but only to such an extent as to enable the reader to understand what he is reading about. The remainder of the book is descriptive of the various pests to agriculture. The book is of a very popular character, is well written, classic in its language, and its descriptions are concise and easily understood. It has excellent illustrations, and is, I believe, the best work extant to be placed in the hands of a beginner. The reports of the Entomological Society of Ontario contain a vast deal more information than is contained in Harris’ or any other one book, because they cover a much wider field, and are the results of the gleanings from other works, added to the experience of the writers themselves. I think it would be possible to reduce to the limits of a hand-book the mass of information given in these reports, if they were judiciously handled, and such a volume would be exceedingly valuable to the agricultural community.”

CHAPTER VI.

INSECTIVOROUS BIRDS.

What is an Insectivorous Bird ?

No question has presented itself to the Commissioners more difficult to answer than the apparently very simple one, "What is an insectivorous bird?" To give as a reply simply, "a bird that eats insects," would be of little practical value, for it would have to be followed up with the further inquiry, "What insects does the bird eat; are they insects of an injurious or insects of a beneficial order?" Nor does the need for investigation stop here. It must be known what proportion of the bird's food consist of insects; is the bird wholly or only in part insectivorous, or does he eat insects even presumably on a large scale enough to compensate for the fruit or grain he also feeds upon?

The Insectivorous Birds Act.

The Act of the Legislative Assembly relating to insectivorous birds has no preamble, and to its title alone we have to look for some clue to its object and intention. It is intituled, "An Act for the protection of insectivorous and other birds beneficial to agriculture." As it is not pretended by anybody that birds are beneficial to agriculture in any other sense than in an insectivorous capacity, the value of the words "other birds" in the title of the Act is not very plain. It is clear, however, that it was for a purpose "beneficial to agriculture," and no other, that the Act was passed. The birds it is intended and desired to protect must, therefore, be birds *insectivorous in a sense beneficial to agriculture*, and deserving of protection on economical grounds.

Now it is usual for Parliament to deal very cautiously with either a natural or acquired right. No older right exists to take life than that given to man over the whole inferior creation. And the Commissioners do not call to mind a single instance, other than the one in question, so far as Canadian legislation is concerned, wherein this right is revoked or terminated. The laws relating to the capturing of fish or the killing of game are regulations only against killing in a certain way or at a certain time, in order that there may be more fish or game to kill at another time. Yet, exceptional as the Insectivorous Birds Act is in its nature, it may be safely averred that neither the collective wisdom of the Legislature nor the re-

searches of any naturalist, or any body of naturalists in the Province of Ontario, could, when the Act was passed, nor since, have decided with scientific accuracy, or even upon such facts as would justify a legal opinion or judgment, what is an insectivorous bird in a sense beneficial to agriculture.

The Legislature, by a wholesome inclusion, in the protecting clauses of the Act, of nearly the whole family of birds, has essayed a short cut through the difficulty. The Act exempts from protection only game birds, cage birds, or poultry, and eagles, falcons, hawks, owls, wild pigeons, king-fishers, jays, crows, and ravens. Save, and except, for scientific purposes, under a special license from the Commissioner of Agriculture, no other bird must be shot, captured, or in any way molested, and the birds' eggs are as sacred as the birds themselves in the eye of the law. *A fortiori* every one of the protected birds is declared to be insectivorous in a sense beneficial to agriculture, and no man is entitled even to defend his own property against their ravages by shooting them, although they be detected in the act of swallowing the last cherry on his tree, or the last grape on his vines.

After obtaining the best evidence at their command, the Commissioners are unable to suggest any very satisfactory classification of birds, according to habits or utility. They believe that the services of birds, as destroyers of insects, are greatly over-rated, and that, as indicated in the previous chapter, assistance must be sought from friendly insects, aided by human vigilance and scientific knowledge, for relief against the ravages of injurious species, rather than from birds. They have evidence, too, that grievous injury is often done to the interests of the fruit grower by birds whose rapacity is undeniable, but whose claim to be insectivorous, in any appreciable degree, is, to say the least, extremely problematical.

The witnesses available on this subject were few in number, ornithology being a branch of natural science to which, in this country, little attention has yet been paid. The gentlemen orally examined gave their evidence with great caution, and fully admitted the difficulties of coming, on many points, to a satisfactory conclusion. The Commissioners regret that they had not an opportunity of personally examining the Rev. Vincent Clementi and Dr. Garnier, whose answers are given in reply to printed questions—more especially as regards the last named gentleman, whose replies, somewhat emphatic in their tone, might, perhaps, have been modified on the reflections suggested by an interchange of views with others, in that kind of open council which, during their investigations, the Commissioners have always encouraged.

Between Messrs. W. E. Saunders, Brodie, and Clementi, the differences of opinion are not very startling. Mr. W. E. Saunders and Mr. Brodie both proceed on the plan of examining the contents of the stomachs of birds, in order to decide on the character of the food consumed by them. It is next to impossible to come to any determination, on this point, by watching the movements of many birds while feeding. Only by careful and continuous study of a bird's habits,

supplemented by numerous *post mortem* examinations, can even an approximate judgment be arrived at; and, when the presence of insect remains is conclusively established, the most accomplished entomologist, aided by a powerful microscope, will often be puzzled to decide whether the fragments of legs or wings discernible belong to an injurious or a beneficial insect.

Birds Feeding on the Wing.

Mr. W. E. Saunders in his evidence takes, first, birds that feed exclusively on the wing and are therefore insectivorous in the sense of living entirely on insects. Among these, he classes the fly-catchers, of which the king-bird (*Tyrannus carolinensis*) and peewee (*Sayornis fuscus*) are the commonest varieties, feeding largely on flies; the night-hawks (*Chordeiles popetue*), which eat flying-ants, night-flying moths, and flies, in large quantities; and swallows (*Hirundinidæ*), whose food is of much the same character as the others. Mr. Brodie is in accord with Mr. W. E. Saunders on these points, including also the whip-poor-will (*Antrostomus vociferus*) in the list. The bald fact, that these birds make their food of insects, and of insects exclusively, is well-nigh beyond question. But, on the other hand, it is not pretended that they discriminate between the beneficial and injurious species. The swallow or king-bird, chasing even an injurious insect in the air, may be really only pursuing a creature already marked for death by a friendly little parasite, whose whole progeny are sacrificed by the action of a bird presumably "beneficial to agriculture." Still, as these birds do no direct mischief, and as they do undoubtedly eat a great many noxious insects, they may be ungrudgingly left to the enjoyment of protection.

Birds partly Feeding on the Wing.

The second class of birds noticed includes those which take their food partly on the wing and partly at rest, their services, in an insectivorous sense, being probably greater than those of the former class by reason of their insect food being of a character more injurious to the agriculturist or fruit grower than the species ordinarily consumed by the birds previously mentioned. In the second class, Mr. W. E. Saunders includes the following:—

The yellow warbler (*Dendroica aestiva*), chiefly taking its food on trees, eating a few insects on the wing, the larvæ of moths, and the eggs of insects;

The redstart (*Setophaga ruticilla*), of habits very similar to those of the yellow warbler;

The red-eyed and warbling vireos (*Vireo olivaceus* and *Vireo gilvus*), also busy hunters for insects, and, by the witness, considered entirely insectivorous;

The cuckoos (*Coccyzus americanus* and *C. erythrophthalmus*), one of which shot by the witness, had a stomach full of tent caterpillars;

The bluebird (*Siala sialis*), which, eating at times a few seeds, is usually insectivorous ;

The nuthatch (*Sitta carolinensis*), of which Mr. W. E. Saunders says :—

“The nuthatch devours a great many insects. It is a very common bird, staying in this latitude all the year, and feeding almost entirely on insects. It pays no attention to posture when eating, and can take its food in almost any position. It devours a good many eggs of insects in the winter, and also chrysalids. It is particularly beneficial to us on account of its remaining the whole year. When it does eat anything but insect food, it seems to prefer the beech nut. I have seen them hiding beech nuts in the cracks of logs or in the holes of trees, apparently for winter use. Its name originated in England.”

And the woodpecker family, the latter including the high-holder, the red-headed woodpecker, the hairy woodpecker, and the downy woodpecker.

With the exception of the woodpeckers (*Picidæ*), which also come under this class, Mr. W. E. Saunders gives all the birds named up to this point the credit of being with scarcely an exception insectivorous in the fullest sense, in other words, insectivorous at all times.

Mr. Brodie, as respects the second class just enumerated, expresses an opinion slightly different in terms from that of Mr. W. E. Saunders as respects the bluebird, of which he says :—

“The bluebird in early spring is a very general feeder. It feeds on grain pretty largely, on the seeds of the wild rose, ants, small beetles, and the larvæ of diptera.”

Mr. Brodie, it will be seen, credits the bluebird with a greater appetite for grain or seeds than does Mr. W. E. Saunders, but the difference is not an important one.

As to the cuckoo, Mr. W. E. Saunders credits him with an appetite for tent caterpillars ; Mr. Brodie proves that he feeds largely on grasshoppers and soft larvæ ; Mr. Clementi, while allowing him to eat berries occasionally, claims for him the character of a very useful bird, and Dr. Garnier is at one with all the other witnesses as to the cuckoo's general usefulness.

Nor does there seem to be any disagreement about the habits and utility of the nuthatch and the vireos, although the Commissioners are not acquainted with any bird known to naturalists by the name of the “worm-eating vireo,” mentioned by Dr. Garnier.

But, while it is pleasant to point out instances where the evidence of several persons is in accord, it is no less the duty of those who review it, to refer, with all respect, to statements which do not appear well founded. In answer to the question, “What birds have you found to be *insectivorous at all times* ?” Mr. Clementi, among others, mentions robins ; while Dr. Garnier replies :—

“Robins, bluebirds, the finches, warblers, cuckoos, crows, all sorts of blackbirds, jays, woodpeckers, thrushes, snipes, wrens, fly-catchers, cherry birds (called cedar birds), and swallows.”

Either the question was not clearly understood or the answer was surely too hastily penned.

As to the robin, his fruit-eating propensities are testified to by every fruit grower examined by the Commissioners, while his insectivorous tastes are certainly kept, during most of the year, greatly in the background. His character and habits will be discussed hereafter. But Dr. Garnier answers himself when he names *Turdus migratorius*—this very robin—as one of the birds “most destructive to fruits.” It is hardly safe after that to claim that he is a bird “insectivorous at all times.”

Passing over the bluebird, the next on Dr. Garnier’s list is “the finches.” Surely there is a slip of the pen here, for, if ever birds were provided with a seed or grain eating beak, it is the finches, and it is not probable they so far mistake the designs of nature as to be “insectivorous at all times,” even, if to some extent, they treat themselves now and then to insectivorous delicacies.

Admitting the merits and usefulness of warblers and cuckoos, it is next suggested that crows and blackbirds are “insectivorous at all times.” Dr. Garnier even speaks of the crow as “one of the best friends of the farmer” and the shooting of him as “a crime.” It would be interesting to know—not whether with the aid of a glass the Doctor saw or thought he saw a crow eating a potato bug but—whether he has ever found, in a crow’s stomach, a single cut-worm or those “myriads of coleoptera” he speaks so confidently of the crow devouring. In the absence of a very positive assurance of such decisive proof, it is not easy to discredit all previously ascertained facts as to the habits of the crow, a bird which even the Legislature that passed the Insectivorous Birds Act, has left to the mercy of its enemies.

And, even if it were possible to believe everybody had hitherto been wrong about the crow, Dr. Garnier’s own further statement would surely conflict with his assertion that the crow is “insectivorous at all times,” “one of the farmer’s best friends,” “a most useful bird to the farmer,” and “harmless,” for, in answer to the further question, “What birds are most destructive to grain?” he says, “*In some localities, crows, in all localities blackbirds of all sorts.*”

Yet even more extraordinary is the statement that the jay is “insectivorous at all times,” another bird which is left to his fate by the Legislature, and which is known to feed largely on the eggs and young of other birds. Of the woodpeckers, thrushes, and cherry birds, sufficient will appear in evidence to suggest reconsideration on the part of anyone who may believe them to be entitled to the credit of being “insectivorous at all times.”

Coming back to the list of birds in the second class, Mr. W. E. Saunders discusses the character of the woodpecker family. He says:—

"The commonest by far in this section is the red-headed woodpecker (*Melanerpes erythrocephalus*), and it is beginning to be generally considered injurious, principally on account of its habit of destroying so much fruit. It does not feed entirely upon insects—in fact where there is fruit to be had it prefers it. The fruits which I have found in their crops are chiefly cherries and apples. On the whole, I have not studied them sufficiently to give an opinion as to whether they are injurious or beneficial, but where they are abundant I should certainly say they were injurious on account of their destroying so much fruit."

He adds of this rather dubious member of the group:—

"I don't think the law should protect them so stringently that parties should not be allowed to shoot them, if they think it necessary to do so for the protection of their crops."

As regards the highholder (*Colaptes auratus*), he regards his occasional attacks on cherries and other fruits, as more than counterbalanced by his services in devouring insects. Of the hairy and downy varieties, he says:—

"The hairy and downy woodpeckers (*Picus villosus* and *Picus pubescens*) are called sap-suckers, though there is very little satisfactory foundation for the idea that they injure trees by sucking the sap. The nuthatch and yellow-bellied woodpecker are generally included in the same category. The last named is perhaps injurious in that respect.

"I have never seen any injury done to trees from the punctures made by these birds, and the trees upon which they have been operating generally appear to be perfectly healthy. From the number of holes which they make in the tree, I should say that if their purpose were to obtain sap the trees would die. I think that these classes of birds, with perhaps the exception of the red-headed woodpecker, are, on the whole, beneficial."

Mr. Brodie, of these birds, says:—"The *Picidae* (woodpeckers) are insectivorous, with a few exceptions."

"Woodpeckers are injurious to cherries and sweet apples, when these fruits are ripe. Some time ago, in Whitchurch, there was great difficulty in keeping sweet apples from being destroyed by woodpeckers. I think that the apple attacked at that time was natural fruit, a seedling."

He says further on:—

"Woodpeckers, as well as other insectivorous birds, feed on pupæ of insects. I have found in a number of cases the cocoons of the *Cecropia* killed by woodpeckers. In the fall of 1867 I collected in Whitchurch over a hundred *Cecropia* cocoons, and there were only three living among them. The others were all punctured by woodpeckers. The pupæ of arctians are preyed upon by the yellow-winged woodpecker."

But while giving them credit for these good services, he is obliged to add:—

"The hairy woodpecker, the downy woodpecker, and the red-headed woodpecker are all objectionable, because they destroy fruit."

Mr. Clementi says of the woodpeckers, in answer to a question as to their fruit-eating habits:—

"I think only the red-headed, which devours apples, pears, and cherries. Some, such as the golden-winged, red-bellied, and pileated, eat Indian corn occa-

sionally. The golden-winged may eat cherries occasionally, but the only one really fond of fruit is the red-headed."

Dr. Garnier credits the woodpecker with feeding on the curculio, although that is not the opinion of other witnesses. Dr. Garnier's statement that he found the stomach of a downy woodpecker full of curculios is startling, for no witness before the Commission has been able to credit any wild bird with a disposition to reduce the numbers of that insect pest.

The point is one that has long engaged the attention of entomologists. Dr. Trimble, of New Jersey, who made a long and patient investigation of this subject, and who is author of a work on the curculio, once found some insect remains in a bird's stomach, which he came to the conclusion must be those of a curculio. But his conclusions were disputed by his brother entomologists, and no other scientist—until the extraordinary spectacle of a woodpecker with a stomach full of them was presented to the eyes of Dr. Garnier—has ever found even traces of the curculio in the stomach of a bird.

Ground Feeders.

The birds that take their food almost or altogether exclusively on the ground, including the thrush family, of which the most uncommon are the robin (*Turdus migratorius*), the tawny thrush (*Turdus fuscescens*), the brown thrush (*Harporhynchus rufus*), and the cat bird (*Galeoscoptes carolinensis*). Of the habits of the robin, Mr. W. E. Saunders says:—

"From my examination of the stomach of the robin, I have not much to say in their favour. Out of perhaps twelve to twenty stomachs which I have examined, only about one-third to one-fourth were found to contain insects in any large numbers, and these only at a time when they could not obtain fruit. The insects were chiefly *Coleoptera*. I also found quite a large number of earth worms. When they cannot get fruit, I should say that their softer food is chiefly earth worms. I do not remember finding any caterpillars in their crops, though more thorough search might reveal them. This spring we had a great abundance of a brown grub, called the cut-worm, which is very destructive to early crops, but I never found one of them in the robin's stomach.

"Of the beetles of which I found fragments in their stomachs, I recognized several times specimens of the *Carabidæ*, which are very beneficial by feeding on injurious insects. . . .

"At the time when the robins were feeding on fruit, I found a small portion of insect remains in their stomachs—perhaps about ten per cent; but when they can get fruit, especially cherries, they prefer it.

"I have noticed extensive mischief done by them, when they are numerous, especially to cherries, of which, between them and the cherry bird, not half a crop was gathered. They feed largely, too, on raspberries, when that fruit is in season, and the cat bird also eats raspberries. It belongs to the thrush family. They do not attack strawberries very much, probably because they are not so easily discovered and eaten as the raspberry and cherry. . . . They eat grapes in large quantities. Late in the fall I have seen flocks of two or three hundred robins on the Clinton grape."

Mr. Brodie says of them :—

“During the breeding season of the robins, the young birds are fed with larvæ; in the early season and later in the season they are fruit eaters to a large extent. I got a few specimens sent to me the other day, and the necks were crammed with berries of the mountain ash, and I have often taken them with a couple or three cherries; usually there is only one, but I have got sometimes three. To a small extent I have found robins attacking earth worms. I have found them especially fond of the elaters or wire-worms, such as they find in dung or other decaying vegetable matter. When robins attack larvæ during the breeding season, they attack them for their young as well as for their own food.”

“The robin,” says Mr. Beadle, “is sometimes very injurious to grapes; when they come in large flocks they will sometimes ruin a small vineyard.” “The birds,” he adds, “most destructive to fruit, are the cedar bird, the robin and the woodpecker.”

Mr. Dempsey says :—

“I am very little posted on the good which the robin does, but I have had quite a sad experience as to the damage he does, as I have had nearly my whole crop of grapes destroyed by robins.”

Mr. Arnold remarks :—

“The robins are a perfect pest. They will take anything and everything, including plums. . . . The robins are most destructive from the first ripening of the earliest cherry until November. They steal all the grapes, and then they clear out. I have a tree of the Early May cherry, which is at this moment literally covered with cherry stones, with not a particle of flesh on them. The robins and cherry birds have cleaned it. The cherry bird is also an unmitigated nuisance. I have known the robin to eat ground worms, but I never knew him to eat the curculio or the cabbage worm, or anything of that kind. He is carefully protected by law, but in self-defence I am compelled to shoot him on my own grounds.”

Mr. McD. Allan, Mr. Westland, Mr. Dougall, Mr. Mackenzie Ross, and Mr. Chaplin, all large fruit growers, testify to their personal experience of the ravages of the robin, while his insectivorous services (if he has rendered any at all) have been so trifling as to escape the notice of these intelligent and observant witnesses.

The tawny and brown thrushes and the cat bird are admitted to be almost or altogether insectivorous in their habits, and if they eat both injurious and beneficial insects it does not appear that they eat anything else to an extent to be appreciable.

Of the blackbird family (*Icteridae*) several members, particularly the crow blackbird (*Agelaius purpurens*), are certainly graminivorous, and, when they appear in sufficient numbers, injuriously so. The crow blackbird, too, has a reputation for eating the eggs of smaller birds. The admission made by Dr. Garnier, too, that, in all localities blackbirds of all sorts are birds most destructive to grain, would seem to imply a consensus of opinion that this group, if partially or in a problematical sense, beneficial, are on the other hand unequivocally mischievous.

The cow bird ought certainly not to be exempt from the penalties of the law if insectivorous birds are to be protected, for its habits are destructive to a large number of the more useful birds. Mr. W. E. Saunders' description of the cow bird is as follows:—

“The cow bird, like the cuckoo of Europe, lays its eggs in other birds' nests, and I should say that it is decidedly injurious, because it generally selects the nests of small birds, such as the sparrows, the warblers, and occasionally the tawny thrush.

“The young of the cow bird are generally larger than those of the bird in whose nest its eggs are laid, and being more clamorous for food as well as larger, the result generally is that the rightful tenants of the nest die of starvation. In fact, I have never been able to find young cow birds of large size along with the young of their foster parents, though the two kinds of eggs are found in the same nest. I attribute this to the fact that the intruders absorb the entire attention of the foster mother. The dead birds are generally carried away to a distance. On account of these habits I should say that the cow bird is decidedly injurious. The cow bird generally lays only one egg in a nest, but I have found nests with two eggs of the owner, and five of the cow bird, but I should judge that the latter were laid by different birds. I have no idea that the cow bird compensates us in any way for its destruction of insectivorous birds, though perhaps one-half of its food consists of insects.”

In a negative sense, seeing that it lives largely on insects—chiefly beetles and grasshoppers—and is not known to be injurious to the agriculturist to any appreciable extent, the meadow lark (*Sturnella magna*) may be treated as a beneficial bird.

The Baltimore oriole (*Icterus Baltimore*), although Dr. Garnier says he sometimes eats cherry blossoms, is probably entitled to favourable consideration. The Doctor further remarks, that the bird eats the catkins of the beech.

The sparrow tribe and its sub-families includes, in an ornithological sense, many birds which popular notions do not in any way identify with the sparrow. The song sparrow, the indigo bird, the grass finch, the gray bird, or chipping sparrow, the chewink, the purple finch, the black snow bird, the canary, the larks, the house wren, the chickadee, the kinglets, the American creeper, are all mixed feeders, living partly on insects and partly on seeds, beneficial certainly to some extent and not manifestly injurious.

As to the new importation, the English sparrow, opinion is more divided. In his own country he is certainly not regarded as an unmixed blessing to the gardener or farmer. In Germany the sparrows became so numerous that a price was put on their heads, and they were nearly exterminated. But insects increased so fast in the absence of the sparrows, that a fresh supply of sparrows had to be imported. In Ontario they are as yet little known beyond the neighbourhood of

towns and cities, where, being non-migratory, they find food and shelter in the winter months. Mr. W. E. Saunders speaks very cautiously about the English sparrow, but he says:—

“I have not noticed that the English sparrow is particularly pugnacious, or that it destroys the bluebirds’ nests. I noticed, however, that places where the white-bellied swallow used to breed every year, were this year taken possession of by the sparrow. I could not say that the number of swallows has been affected by the importation of the sparrow.”

Mr. Brodie says, the sparrow has been found to destroy the fruit buds of the gooseberry and red currant; he also remarks that they feed largely on the larvæ of scavenger insects, which are mostly beneficial. Mr. Beadle believes the sparrow will become a great pest. He endorses the statement that it destroys fruit buds, and “doubts if it eats insects at all.” The English sparrow has been credited with eating the larvæ of the cabbage butterfly, but not to so great an extent as to stamp him beneficial on that account.

Mr. Leslie of Toronto, who sees them in flocks of hundreds, says:—

“We have English sparrows with us, but so far as I have seen they are not destructive, though I cannot see that they do any good. They seem to feed altogether along the roadsides, and do not appear usually to go five yards from the streets. From the fact that they consumed a field of oats belonging to a gentleman in our vicinity, to the distance of about 100 yards from the fence, I should say they are graminivorous. I have never seen them touch an insect, though Mr. Allan, of Goderich, informs me that they devoured the worms on the cabbages in his garden. The sparrow is a pugnacious little animal, and drives away a good many valuable birds. It is, however, to insects that we must look for deliverance from insects more than to birds.”

Mr. Clementi, on the whole, regards English sparrows as non-beneficial, while believing that the sparrow devours caterpillars and various insects. Mr. Clementi says:—

“On the whole, I think it is likely to prove the reverse of beneficial. It devours large quantities of grain; and it also drives away, where it has the chance, our native birds.”

Dr. Garnier takes the opposite view, if his meaning be clearly understood. He says:—

“A pair for some years have bred in my swallow house. They feed their young entirely on insects, and live on insects. I never once saw one in a wheat field or oat field. It devours immense quantities of larvæ of spiders.”

And when asked, “Is the introduction of the English sparrow likely to be a benefit to our farmers and fruit growers or not?” he says:—

“It certainly is for their good. It bosses the poor swallows and bluebirds, and stops with us all winter, and eats grain then for subsistence.”

Now the statement that Dr. Garnier never saw a sparrow in a grain field is too strictly negative testimony to found a judgment upon, in face of the positive fact

of the sparrows' depredations in the field of oats seen by Mr. Leslie. Dr. Garnier asserts, however, that the sparrows "devour immense quantities of the larvæ of spiders." A spider is not in an agricultural sense injurious, but quite the reverse. So that, if the sparrow did eat the larvæ of spiders, it would be mischievous, not beneficial. It happens, however, that the spider has no "larvæ." It does not exist in the larval state at any period of his life, but its young are produced from eggs in a perfect condition.

More difficult is it to arrive at a conclusion on Dr. Garnier's testimony when his opinion, as to the generally beneficial effect of the introduction of the sparrow, is taken in connection with his account of its disposition and habits. He says the introduction of the English sparrow is likely to be a benefit to the farmer, and adds, apparently as an explanation or reason, "It bosses the poor swallows and bluebirds, and stops with us all winter and eats grain for subsistence."

Now, as there is neither seed grain, nor standing crop to be attacked in the winter, the sparrow can do no harm in that sense at that season. But what good it does by being a grain eater at any time is quite incomprehensible.

By "bossing the poor swallows and bluebirds," is probably meant what other writers describe more definitely, namely, that the sparrow harasses and drives away or dispossesses those birds.

Dr. Garnier, however, says of the bluebird, "This bird destroys *diptera* more than and other sort, as I have watched a pair feeding their young in my garden, and they bring all sorts, as lacewings and caterpillars especially."

Lacewings and caterpillars do not belong to the class *diptera* but to *neuroptera* and *lepidoptera* respectively, and the lacewings deserve to rank among our best friends, since, in the larval state, they devour immense quantities of plant lice. Still, the consumption of lacewings and caterpillars is evidently regarded by Dr. Garnier as a meritorious habit. Besides, the bluebirds are of the species said by Dr. Garnier to be "insectivorous at all times." How then can the farmer be benefited by the bluebird being persecuted or expelled from its haunts? The swallow, too, is admitted by everyone to be exclusively insectivorous. What benefit can result to the farmer from his expulsion? yet the only meaning it is possible to attach to the statement is that the farmer is benefited by birds presumably most beneficial being driven away by a bird that is only insectivorous in a very modified sense, and who, if his chief food be spiders or their young, is himself injurious.

The Commissioners have come to the conclusion that too little is as yet known of the probable effects of introducing the sparrow to express a decided opinion on its advantages or otherwise. They can discern no appreciable benefit from its presence; there are indications that its tendencies are harmful, and, while they would be sorry to see any step taken hastily for its extermination, they can discover so sufficient reason for any protective legislation in its behalf.

The cherry bird, known also as the cedar bird or waxwing, is a bird condemned as an incorrigible thief by every fruit grower. His injuries to the fruit crop are even appraised at a higher rate than those of the robin. Mr. W. E. Saunders says of him:—

“I have never found the waxwing feeding on insects. Most birds feed their young on insects, but I am not sure with regard to it, and am rather inclined to think that insect food forms a very small proportion of its diet, because, just as soon as the young can fly from the nest, they go to the late cherry trees and devour fruit. On the whole, I regard it as an injurious bird.”

Mr. Brodie sets him down as a fruit eater. Mr. Clementi says, in answer to the question, “Does the cherry bird (*Ampelis cedrorum*) eat any appreciable quantity of insects?” “I think not. They catch some flying insects when they cannot obtain berries. They are most destructive to fruit although they are enemies to the canker worm.”

Dr. Garnier, however, says:—

“It (the cedar bird) is truly a fly-catcher, and catches them exactly as a fly-catcher, perching on any dry limb, and pursuing them in the air. It destroys a good many strawberries and cherries, but all the rest of the season destroys insects,” and, of the same bird, he remarks, “any destruction of fruit is more than repaid by insects destroyed.”

The Commissioners have no evidence before them that at all justifies such a conclusion. The best information they can obtain is to the effect that the cedar bird does the least possible amount of good for the greatest possible amount of harm, and that his protection is a direct injury to the fruit grower.

Of the birds unprotected by law, the owl is probably one—perhaps the only one—that has reason to complain of its treatment. Its food consists largely of mice and other small animals, and, as it moves about almost entirely at night, it is not, as a rule, a devourer of small birds.

If, too, the object be to protect insectivorous creatures, why are the toad or the bat unprotected? “The toad,” says Mr. Brodie, “feeds on cut-worms, which on account of their nocturnal habits, are not so liable to the attacks of ichneumons.” Mr. Brodie, from motives of humanity, and the love of every true scientist for the works of creation, would not annul the law protecting birds, but extend it to toads and squirrels. But he has no faith in birds as protectors against insects, for he says, at the close of his evidence, in answer to a question put to him as to what plans he would suggest as a means of protection against insect ravages:—

“I would suggest: (1) Legislation to prevent the cultivation of affected crops over affected areas for one or more years. (2) Encouraging original researches into the habits and life history of native parasites through scientific societies or otherwise. (3) Artificial protection and assistance to the increase of native parasites? (4) Importation and acclimatization of foreign parasites that are likely to be useful, wherever found. (5) Protection to insectivorous animals that are nocturnal feeders. (6) Killing injurious insects in the imago form only.

(7) Collecting the larvæ of injurious insects and placing them in suitable receptacles, so that the parasites may mature and escape."

Being asked: "Are there not practical difficulties in the way of introducing foreign insects?" he replies: "In some cases perhaps so, but English insects have been taken to Australia, American to Europe, European to America; bees have lately been brought from Jerusalem to Ontario; in fact it has been proven that insects may be brought from distant countries with a large measure of success."

Asked again, "Would he consider the encouragement of parasitic or beneficial insects a paramount object in combating injurious species?" he says:—

"Yes, that is what I would especially urge as the important consideration; it is clearly in harmony with the order of nature; certainly the plans heretofore recommended, and often extensively practised, have been failures more or less; in fact there are good grounds for the farmer's want of confidence in scientific men."

Mr. Bethune holds very similar opinions, as his evidence shows, while he is reluctant to withdraw existing protection even from those whom he designates "feathered thieves." He says:—

"But I think there can be no doubt that the parasitic insects are, beyond all comparison, our best protection against the ravages of noxious insects. I should be very sorry to see the robin exterminated, though I think he consumes a great deal of good fruit. A stuffed eagle or hawk, or other bird of prey, set up on a pole in the midst of the trees during the fruit season, has the effect of frightening away robins, cherry birds, and other feathered thieves, though it sometimes loses its virtue from the birds becoming accustomed to it. I would not advocate the passing of an Act, taking away the protection of the law from such birds as the robin, while extending it to others. I think very great difficulty would arise from any such attempt at discrimination."

Mr. William Saunders enters more largely into this question. At the close of his evidence he says:—

"So far as my experience has gone, and it has been tolerably extensive in this matter, I have become more convinced every year that we cannot depend on insectivorous birds for the subduing of any insects which injure our crops or our fruit. In proof of this I would refer to two or three examples.

"Take for instance the cabbage butterfly. It is an insect which is very vulnerable to attack. It is constantly on the wing during the day-time, when insectivorous birds are flying about, and when they could easily catch and devour it. The larva feeds in exposed situations on cabbage leaves, where the birds could readily discover it if they wanted to do so. It is a smooth, juicy larva, such as one would fancy the birds would like to feed on; yet this insect, from the introduction of one or two specimens at Quebec, has spread until it is now abundant over an area extending from Alabama in the south to Lake Superior in the north, and from the Atlantic Ocean to several hundred miles distant in the west—an immense district over which insectivorous birds abound.

"The forest tent caterpillar, to which I have already referred, is at times very prevalent in Ontario, and the only bird I have ever known to devour that insect is the cuckoo.

"The parasitic insect which attacks the cabbage butterfly is the only means by which we can hope to control that insect. It has for many years controlled it in Europe, and it is now keeping it under in a large number of localities in this

country, and this parasite is spreading so rapidly that we hope it will shortly so far control the injurious cabbage butterfly that it will cease to be a serious evil.

"Cut-worms have been very abundant in the neighbourhood of London during the spring—so much so that they have devoured cabbages in enormous quantities, and consumed flowering plants, having a special fancy apparently for pansies. They move about early in the morning, and early in the evening, and any bird that has the habit of scratching a little could scratch this larva out even in the day-time. I had a number of birds shot and their crops examined during the prevalence of this insect, and I could not find one in the crop of any bird I got; on the other hand, when I reared a number of the larvæ with the view of breeding the moths, I found them so affected with parasites that I did not get a single moth, so that, although the larvæ were exceedingly abundant, the moths proceeding from them were comparatively rare, and all through the agency, not of the birds, but of the parasites.

"The currant worm is another instance of the spread of an insect peculiarly exposed to the attack of birds. It is to be seen about currant bushes all day long; it does not hide in any way; it is a smooth larva which you would think birds would eat; but I have not found a specimen of it in any bird's crop. This insect has spread to almost as great an extent as the cabbage butterfly, without being checked at all by insectivorous birds. There is no parasite that lessens its numbers yet to any extent, but with the use of hellebore we are able to keep it within bounds.

"I do not attribute the occasional abundance of insects to any diminution in the number of the birds. I am quite satisfied that we have to look to the insect world to control that part of the insect world which is destructive to our crops. If the birds, many or few, were doing this work, we should find proofs of the fact in their crops, and the smaller the number of birds the greater would be the proof, as they would have all the more to eat.

"The same remarks might be made with regard to the Hessian fly and the wheat midge. Swallows and other insectivorous birds may occasionally devour a few of these small midges, but we have no proof of it, and the probability is that their work in this direction has been overrated. I have referred to these few instances because the insects I have mentioned are well known, and the fact cannot be controverted that they have largely increased even when surrounded by birds.

"I should be sorry to see birds unnecessarily destroyed, but I think that well known depredators should not be protected under a false plea to the injury of the fruit grower. I do not see why the robin and cherry bird should be protected any more than the jay or the butcher bird. These do not do any more harm than the robin and cherry bird do. Certainly their work is not so ever-present to the eye of the fruit grower as the work of these persistent fruit devourers."

In these remarks the Commissioners fully concur. Why the fruit grower should have to stand idly by, nor dare, under the fear of legal penalties, to protect his own property from destruction; why he should be, in fact, the sole exception to the universal right of self-protection, is incomprehensible. At least in his own grounds, and against notorious offenders, he should be entitled to act summarily.

CHAPTER VII

BEE FARMING.

The bee farming industry, in the Province of Ontario, had not, until recently attracted a very large share of attention. For some years, however, it has been carried on by several persons with judgment and intelligence, upon improved methods, and, of late times, very satisfactory results have, in not a few instances, attended these efforts. To-day the Province can probably boast of operations, in connection with this industry, as spirited and enterprising as are to be found in any part of the world.

The Commissioners have noticed with pleasure the formation of a Bee-Keepers' Association, and have no doubt the bee-masters will derive as much advantage from mutual co-operation and frequent consultation as the dairymen, fruit growers, and others.

During one of the sittings of the Commissioners, at Toronto, Mr. D. A. Jones, who is probably the largest bee farmer in the Province, returned from his visit to the island of Cyprus and the Holy Land, whither he had gone to obtain, and secure the regular importation of queen bees of the celebrated breeds raised in those countries. Mr. Jones gave the Commissioners an account of his trip and arrangements for the shipment of the bees, as well as most valuable evidence on bee farming generally. He also exhibited specimens of cereals of varieties at present unknown in Canada, which he had collected during his journey. His evidence, and that of others relating to bee farming, will be found in Appendix F.

Varieties of Bees.

The honey bee is not a native of Canada, but must have been imported originally from Europe. Any wild bees, of which numerous swarms are found in our woods, are the representatives of escaped swarms. The common black, or European bee, is thoroughly acclimatized, but the stocks have been, to a very large extent, improved by the introduction of Italian queens. The native bees, hybrids obtained from the above mentioned varieties, and now the Cyprians, constitute the honey bees of the Province at this moment.

Of the respective values of the older varieties, Mr. Jones says :—

“ It is frequently the case that the bees used in this country are hybrids—crosses between the blacks and the Italians. The black queens mate with the Italian drones, and the Italian queens mate with the black drones, and some have had them hybridized in order to test their qualities. The hybrid is not nearly so good as the Italian bee, but it is better than the black bee. The Italian bees are better workers and better breeders than the hybrid bees, as well as better tempered and more easily managed. The hybrids are crosser than either the black bees or the Italians.”

Mr. Dempsey, on the other hand, rather favours the hybrid bee. He says :—

“ We have both black bees and Italian bees in our district. Most of our successful bee-keepers have introduced Italian bees. The Italian bee appears to be more hardy by itself, and is capable of defending itself in case of attack from other bees and from any other source. In that particular it seems to be preferable to the common native bee. We find that by crossing the two varieties we get a still stronger bee, one which is capable of enduring a greater amount of exposure and cold, and a much more industrious bee. We have never introduced any other varieties of queens.”

Mr. James Maitland, an old bee-keeper in the County of Lanark, gives his views on this point as follows :—

“ There are three kinds of bees in our neighbourhood, the Italian, the hybrid and the club. I do not keep the last named myself. The Italian bee is milder in handling and a better honey gatherer by actual test. I have housed two swarms at the same time, and found the Italian to fill the hive, while the club hive would be only two-thirds full. The Italians are equally hardy. I think the Italians can pierce deeper into the flowers than the others.”

By the “ club,” Mr. Maitland, no doubt, means the common black bee.

Mr. Pettit, of Belmont, County of Elgin, says :—

“ My own bees are Italians, but my neighbours use the native black bee. I have no experience with any but the black and Italian bees. The Italians are superior to the black in the following particulars : they are more gentle under manipulation ; they protect themselves from robbers and the ravages of the bee moth ; they are more industrious when honey is scarce. When, however, there is a good flow of honey the black bees are equal to the Italians. I obtain my supply of queens (pure Italians) from reliable breeders in the United States and Canada. The Cyprians are pretty bees, but I am not acquainted with their other qualities.”

The Hon. Louis Wallbridge, of Belleville, in his answers to questions forwarded by the Commissioners, after mentioning that the stocks in his district were chiefly of the Italian variety, says :—

“ Black bees are understood to be the English or German. The Italians are a better sort. The Cyprus bee is now just introduced, but not tried yet. The common black bee of the woods is the English or German bee. People speak of the gray bee, but when examined, it is the common black bee.”

The full value of the Cyprians has yet, of course, to be demonstrated by actual experience, although it is not to be supposed that Mr. Jones would have incurred the serious cost and responsibility of his mission had he not previously ascertained sufficiently their superior qualities to justify so extensive a venture.

Mr. Jones thus alludes to his previous inquiries. He says:—

“The reason I went to get some Cyprian bees was this. A count in Austria had imported two colonies from Cyprus into Bohemia, and these proved to be so far superior to the Italian bees that they created quite a sensation among bee-keepers, and I visited him last winter previous to going to the Island of Cyprus in order to ascertain the real facts regarding these bees. After collecting all the information I could in Europe, I was thoroughly convinced of their superiority, and went and obtained some. During the time I was in Cyprus I had an opportunity of seeing the bees at work, and to a certain extent testing their qualities.”

He gives also a very important reason for using Cyprian queens, as follows:—

“The Cyprian bee breeds much earlier in the spring and much later in the fall than the Italian. An objection to both the Italian and the black bees has been that they cease breeding too early in the fall, and go into winter quarters with weak stocks. Bees only live from sixty to ninety days in the ordinary course; but while they are lying in a dormant state in the winter the time does not count; so that if many old bees go into winter quarters they die out in the spring, and the hive becomes so weak that the young bees die. . . . I have had satisfactory proof that the Cyprian bees are superior. Count Kolowrat of Bohemia stated that when the Italian and black bees were weak and a mere handful in the spring, the Cyprians would be strong and ready to swarm before the others were thinking about being strong enough to gather honey. On the mountains in Cyprus the weather is severe, but in the valley it is mild; the bees are found both on the mountain and in the valley. Some of the bees I got were from very high up on Mount Troados.”

Having regard to our long winters and extremes of climate the foregoing information is of very considerable interest.

Mr. Dempsey adds the following regarding the age of bees, and showing the importance of strengthening the hive with young bees in the early spring:—

“The extreme age of the working bee is about six months, and they only attain that age in the winter season while living perfectly dormant. When the old bees take their first fly in the spring not more than one in twenty return to the hive. If we have a colony without a queen, when the hive goes into winter quarters, there is nothing in the spring but old bees, and the first fly they take they fail to return. They usually commence breeding about the middle of February.”

Honey-Yielding Plants.

Mr. Jones gives the sources whence the bees gather honey in the following order. The first honey of the season is gathered from the willow—of which there are many varieties—and the soft maples. After this the fruit tree blossoms afford a large supply. For about ten days there then is a dearth, the dandelion

being the chief resource. White clover, raspberry and other wild berry blossoms come next, and after them the basswood tree and Canada thistle. The fall flowers and late-flowering trees and shrubs keep the bees busy to the end of the season. The basswood tree, flowering for some twelve to eighteen days in the month of July, Mr. Jones styles "the greatest honey-producing tree in the world." Its value in this respect both as to the quantity and quality of its honey, should, added to other evidence of its economic merits, induce its cultivation wherever it is not already abundant. Mr. Dempsey adds a little further to the stock of information as regards the honey harvest. He says:—

"We have weeds which produce flowers that yield a good deal of honey. The golden rod is one plant, and from the Canada thistle a very delicious honey is gathered abundantly. In point of flavour, as far as my taste goes, there is nothing which will excel thistle honey. It is slightly yellow and beautiful in appearance. Next in point of flavour is that collected from white clover, which is also yellow. We can distinctly taste the fragrance of the clover in the honey gathered from that plant, as we can the distinctive flavour of the thistle in honey produced from it. The brightest we get and the one which commands the highest price is that from the basswood, as it is white as chalk and clear. The flavour is agreeable to almost all tastes, but it is not so delicious to mine as the other two I have named. There is a very rich quality of honey comes from the buckwheat flowers, and enormous quantities are gathered from the flower of that plant. It has a strong flavour. Golden rod produces a very inferior quality of honey, though it appears to be well adapted to wintering bees. It resembles a mixture of honey and glucose. In fact some people take honey and mix it with glucose and sell it as golden-rod honey."

Mr. Beall, of Lindsay, noticing Mr. Dempsey's remarks, says:—

"There is one weed we have in some places, not mentioned by Mr. Dempsey, which is said to be very fruitful of honey, that is the mullein. I am told by a friend of mine, who has several colonies of bees, that it is honey and not pollen that the bees get from the mullein. There is another plant besides those mentioned by Mr. Dempsey, from which a great deal of honey is got, that is the dandelion. I think the honey from that plant is well flavoured. There is no honey that I like better. The honey does not seem to have the strong flavour of the dandelion. Then, honey is also obtained from the soft maple, the hard maple, the gooseberry and the currant. We have most of the other plants mentioned, and there are besides, the thorn-apple, the raspberry, the asparagus, white clover and alsike clover."

Mr. Pettit says:—

"The honey is principally gathered from fruit blossoms, white clover, and lindens. From the fruit blossoms it is dark, from the clover and lindens it is clear and bright, and of the very best quality."

Mr. Wallbridge gives the following list of the chief resorts of the bees in his district:—

"Willows, soft maple, hard maple, elm, fruit trees, white clover, alsike clover, thistle, basswood. The Italian bees work a little on red clover, sweet alders, the mint tribe of flowers (mignonette, peppermint, catnip, motherwort), buckwheat, golden rod, and other flowers, names of which I don't know."

It is obvious from the foregoing that districts not wholly settled or brought into a perfect and high state of cultivation will on the whole be best adapted for bee farming. The Commissioners will hardly be suspected of giving even an implied approval of the propagation of the Canada thistle as a honey-yielding plant, but it is pleasant to know that, what in other respects is an intolerable nuisance, can plead one useful quality in mitigation of its offences.

As to the quality of honey produced from the various plants, Mr. Jones says:—

“I think clover honey has the best flavour; it is a mild and pleasant honey, and very rich. Basswood honey has more body to it, and any person who likes more strength would probably like basswood honey the best; but it is not liked by everybody so much as the clover honey.

“Almost any of our honey in Canada is quite equal to the foreign honey; and the honey grown in the United States is not so fine as ours unless it is in about the same latitude. The farther south you go the darker and stronger is the honey. I do not look to a foreign market for the sale of my honey; I think we have demand enough in Canada to exceed our supply for some time to come. It readily commands fourteen or fifteen cents a pound.”

Mr. Wallbridge remarks that clover, basswood and thistle honey command the best prices in the foreign market, and also expresses his surprise at the preference in England for honey collected from buckwheat.

Ontario as a Bee-Keeping Country.

As to the adaptability of Ontario to the bee-farming industry, and its capacity for holding its own in this respect against other honey-producing regions, there does not appear to be any cause for discouragement. Mr. Wallbridge says on this point:—

“My opinion is that Ontario is one of the best, if not the best country for bee keeping on this continent. There are in all the accounts you see published a great deal of brag, for which allowance must be made, especially in the United States.”

Mr. Pettit says:—

“Hundreds of tons of honey are purchased annually in California for the English market, at from five to eight cents per pound, the cost of carriage not being more than one cent per pound. California honey is proverbial for its superior quality when left with the bees till ripe or partly capped.”

But Mr. Jones explains why, after all, the advantage may not be absolutely on the side of California. He says:—

“From all I can learn with respect to other parts of the world I am thoroughly convinced that there is no place superior to Canada for bee keeping, if it has an equal. Some people think that California is better, but there they have seasons in which they get no honey at all, and taking everything into consideration, I think our country is the best. In this country we let the bees lie dormant in the winter time; but in California their time of dormancy is in the summer time.

when it is hot, and from the spring to the fall, right through midsummer, they are consuming their stores until they can get honey, whereas ours gather honey all summer, and so consume very little honey. As a feeding ground for the bee, Canada possesses great advantages over any other country, partly because we have many wild flowers, and partly because we have the basswood tree, which is the greatest honey-producing tree in the world."

Bee Management.

Some reference to the methods adopted by the several witnesses in the different departments of bee management will here be in place. The first thing to be attended to, is the strength of the colonies. Mr. Jones says on this subject:—

"One great mistake of many people who keep bees is, that they try to keep a great many colonies, whereas they should endeavour rather to keep strong ones. My bees swarm from June till August; but the best swarms, as a general thing, are early. Sometimes, however, the late swarms are as good as the early ones. My hive is very large—from 3,000 to 3,500 cubic inches; 2,000 cubic inches is the largest that most people use. I am constantly making new hives by taking one comb from each of a number of hives, and here I let the bees begin to hatch another colony for themselves."

Feeding in winter is deprecated by all the witnesses. Mr. Jones' emphatic deliverance on this point is:—

"I never feed my bees in the winter time, and anybody who does will not have any in the spring. That is where the great mistake of most people lies. They disturb their bees and make them gorge themselves; they cannot discharge the excrement; dysentery follows, and they soon die."

Mr. Dempsey says:—

"We scarcely ever feed our bees. We watch closely in the fall of the year, and see that every colony is sufficiently supplied with honey before winter. If we find that any colony is not sufficiently supplied, we supply the deficiency from those which have a surplus. We simply take the full combs of honey from the colonies that have too much and give them to those which have not enough, equalizing the quantity as nearly as possible."

Mr. Pettit is not quite so rigidly hostile to winter feeding as Mr. Jones. He says:—

"I seldom or never feed the bees, except they lack store to carry them through the winter. In that case I dissolve standard granulated sugar, in the proportion of five pounds of sugar to one quart of water, bring it to a boil, and it is ready for use."

Mr. Pettit, however, labours, it is to be observed, under the disadvantage of living in a very fine agricultural section, and bees find less honey there than where a large supply of wild plants is at hand. Mr. Wallbridge is opposed to feeding in winter. He says:—

"Only bad bee-keepers feed bees, or in a poor bee country. A little food in spring to stimulate, is of doubtful good—the quieter the better in the spring. We winter in winter depositories, temperature at 41°–45°."

Everyone is agreed that the quieter the bees are kept in winter the better. A house properly constructed and ventilated, but dark and frost-proof, with a temperature at about 45 degrees, is the best provision that can be made. Dampness in the house or cellar must be particularly guarded against. Mr. Beall mentions an instance within his knowledge of a bee-keeper losing forty colonies in one winter from dysentery, caused by keeping the bees in a damp cellar.

Artificial Comb and Extractors.

A large saving of time and labour on the part of the bees, is effected by supplying them with artificial comb, as well as by the use of an extractor, which leaves the old comb available for further use. Mr. Jones says on this point:—

“We keep our bees in movable comb hives, and we use the honey extractor to take out the honey, and then place the combs back in the hives and let the bees refill them. We do that every five or six days when they are gathering honey, and in addition we manufacture the comb for them, in order to save them from making the comb. One pound of comb given to them saves them from 20 to 25 pounds of honey. It requires 20 or 25 pounds of honey to secrete wax enough to make a pound of comb, and while they are making that wax they lose 20 or 25 pounds more; so that I consider that we save from 40 to 50 pounds of honey by supplying them with the comb.”

Mr. Dempsey describes the method of making artificial comb or comb foundations, as follows:—

“Then there are means of making artificial combs or comb foundations. They take type and set on a couple of rollers, and the wax is run through. In making our frames we have a groove cut in with a saw. We take a narrow strip of this foundation comb and insert it in that, and then we use a little kettle, made like a teapot, only it is double. The outside is filled with water and the interior with wax. The boiling water melts the wax, and we just pour a little of the hot wax along them and it seals perfectly. For extracting honey conveniently we must have a comb straight, and we accomplish that result in the way I have described. For breeding purposes if it is straight it renders nearly all the comb valuable for the brood. If left to themselves the bees make it in all manner of shapes, some places too deep and some too shallow to be used for breeding purposes, consequently there will be only a small proportion of the comb that can be used by them. By using a foundation comb, though, they are perfectly straight. Then supposing a swarm issues in a season when there is an abundant supply of honey, their only object is to supply that honey to make what we call a drone comb. It has larger cells, and they will fill a whole hive. The practice of making an artificial comb is confined to large bee-keepers.”

Mr. Wallbridge, after remarking that “every intelligent bee-keeper uses foundation comb either for the whole frame or as starters,” mentions Mr. W. C. Wells, of Phillipston P.O., and Mr. Lewis Searles, of Foxboro’ P.O., as persons who manufacture comb for those who may not find it worth while to make it for themselves.

Bee-Hives.

Every bee-keeper has his own views as to the form of hive or the improvements that may be devised therein. Mr. Dempsey thinks one movable frame hive is as good as another. A movable frame hive is of course essential to all bee management on modern principles. Mr. Maitland uses the Langstroth improved hive with an eleven-inch frame. Mr. Pettit "prefers a movable comb frame hive, with a top story, which should be removed in winter." Mr. Wallbridge, in answer to the question, What kind of hive do you consider best? says:—

"The Langstroth. I prefer a modification—a little deeper and shorter. The contents ought to be about 2,000 inches cubic."

Mr. Jones goes in for a very large hive, 3,000 to 3,500 cubic inches in size, and of course containing a correspondingly large colony.

Swarming.

Mr. Maitland explains in his evidence the way in which he secures artificial swarms, and thus avoids the risk of losing a swarm, while economising in other respects. He says:—

"I have never bred a non-swarming hive. By artificial swarming I save time as a queen can be hatched out of a brood comb in which a queen cell is sufficiently advanced, and a new swarm got by dividing, in ten days. I sometimes divide by taking out two frames with a queen and then put them on a stand a few feet from the old one, and in ten days divide the old hive again, thus getting two swarms from a hive in one year.

"I was the first to manipulate the bees artificially. With a frame hive I take out one frame with a queen and bees adhering to it, and put it into an empty hive with a foundation comb in it. You can get enough for 35 cents to fill up your hive and give you a month's advantage. I place the new hive in the old one's place, removing the old one 16 or 18 feet. With a common box hive I take it off to one side two or three rods out of the 'fly' of the bees, and leave an empty hive on the stand as a decoy. I next turn the hive of bees upside down, putting an empty one on top, and hammer on the sides for 15 or 20 minutes, and then take the bees drummed off to one side and have an empty hive placed on a large cloth. The hive is placed there to receive the bees. The bees are shaken on to the cloth some two feet from the hive you want them to enter. I lift a few in a cup and pour them in front of the hive, when they will commence to drum and run in. This calls the rest, and if the queen is there they will stay. Before they enter, if you have got too many, take away the hive with the queen and other bees, place it on the old stand, in place of the decoy, and let the balance run into the old hive. The old hive can then be put on a stand by itself, 16 or 18 feet away."

Mr. Dempsey says on swarming:—

"We swarm the bees; you cannot always help it. The difficulty can be overcome, to some extent, by moving the queen cells, although it is not always possible. Before the swarming season arrives, by putting up the outside combs—for the brood is always in the centre—and by sliding the ones in the interior out,

and extracting the honey from these, and putting them in the centre, we can manage sometimes to prevent then swarming for a time."

Mr. Jones, who recommends "Cook's Manual of Bee Culture" as the best work for the intending bee-keeper to read, says :—

"I could teach any one in a short time to make artificial swarms, so that he might dispense with swarming altogether. But it is a very easy matter to get bees into a hive. At a cost of not more than 50 cents, you could make an arrangement, by fixing a crotch in the ground with a pole run through it, and a little box at one end, balanced by a weight on the other, which would catch every swarm."

The Queen Bee.

The queen bee meets the drones in the air, and being once impregnated remains fruitful without further intercourse for the rest of her life, which extends to from two to five years. In-breeding, which is often very pernicious, is avoided by the introduction of fresh queens from a distance. In their journey from Parry Sound to Collingwood the Commissioners were shown two islands, known respectively as Cyprus and Holy Isle, where Mr. Jones with his characteristic energy was breeding Cyprian queens, far away from any risk to the purity of his stocks. No means has, it is stated, been devised for securing the impregnation of the queen without releasing her for a prolonged flight, although this has been attempted to be done, by enclosing her and the drones in a box with a glass top or window.

Yield of Honey.

The quantity of honey which a single colony will produce in a favourable season, over and above the amount required for consumption, will depend on several circumstances, some of which have been already indicated. Mr. Jones puts it at from 100 lbs. to 300 lbs. He gives 75,000 lbs. of honey as the yield, in one season, of 600 colonies, three hundred of which were old, and three hundred new, having been formed during that season only. That would be an average of 125 lbs. per hive. But this is done by adopting, as already noticed, a system of large colonies in a very favourable district and with every attention and appliance the greatest skill and experience can suggest. Mr. Dempsey, in the best year he ever had, got three tons of box honey from sixty colonies, or 100 lbs. per hive, and in his worst year got from 17 lbs. to 18 lbs. per hive. He does not give more than 30 lbs. to 40 lbs. per hive as an average, taking both good and bad seasons into account."

Mr. Beall says :—

"I have the evidence of many persons in saying that one hundred pounds per hive would be a fair average. Last year I got seventy pounds of surplus from one hive."

Mr. Maitland thinks about 50 lbs. of box honey a fair average, but then he has not hitherto used the extractor, which would enable him, no doubt, to obtain a much better yield.

Mr. Pettit says:—

“As kept in this neighbourhood, a hive averages perhaps about 20 pounds of honey in a season, but if kept on scientific principles they would do far better—perhaps average 80 pounds.”

Mr. Wallbridge says:—

“Last year, 1879, a very good year, each hive, taking that as the basis of calculation, averaged 98 lbs. extracted. This is more than a general average—perhaps 75 lbs. would be a fair average; 40 lbs. would be a fair average of box-honey. I have taken 101 lbs. from one hive, and a swarm, box-honey. This is extraordinary.”

Probably all things being ordinarily favourable and the management good, from 70 lbs. to 80 lbs. will be a fair annual yield where the extractor is used.

The Honey Trade.

Up to the present time no foreign trade of any extent has been done in Canadian honey. A small, but very small quantity has been imported, chiefly from the United States, and in 1879-80 Canada exported some 7,940 lbs. weight not an amount of any magnitude in itself, but indicating the commencement of a foreign demand. Of the last mentioned amount 5,418 lbs. went to Great Britain. So far as the Trade and Navigation returns supply any evidence on which to found a judgment it would appear that hitherto the home consumption has been equal to the supply, although it is probable that much less honey is used for domestic purposes than, having regard to its very wholesome nature, would be desirable. Mr. Jones thinks the home demand will absorb all that will be produced for some time to come, although he has had good reason to believe that the British market would be open to Canadian shippers at remunerative prices. At all events there is no fear that anyone going judiciously into bee farming will find the field already too fully occupied.

A “Superstition” Dispelled.

Nor need the dread of handling the insects or moving among them prevent anyone from entering into the business. Mr. Jones gives his experience in this matter as follows:—

“There is no danger of being stung in handling bees; I can handle them just the same as flies without the slightest danger. It is a fact that some persons are more liable to be stung than others; but it is also a fact that a little child that has no fear may walk through a yard filled with bees and not be stung by them, when a grown person will. If you go into a yard and make false motions, and attempt to dodge the bees, they will most likely sting you; but if you go through a yard as though you were satisfied that they will not sting you, they are not

likely to touch you. When you wish to get honey, all you have to do is to take your smoker and blow it into the hive; the bees will then commence to fill themselves with honey, and you can take out the combs and brush the bees off the sides of them like flies, and then remove the honey. We have boys going in and working among our bees constantly, and they seldom get stung. This fear of stinging is a superstition."

Mr. Dempsey says :—

"There are some persons to whom bees are unfriendly; I used to be one of those persons myself; but if they get accustomed to you, and if you treat them properly, they will pay no attention, and they will not sting you even though they may alight upon your face and crawl over it, unless, indeed, you attempt to strike them; if you do they will immediately become aggressive."

Mr. Jones, however, is good enough to add for the information of those who are not so fortunate as himself or Mr. Dempsey in securing the confidence of the bees :—

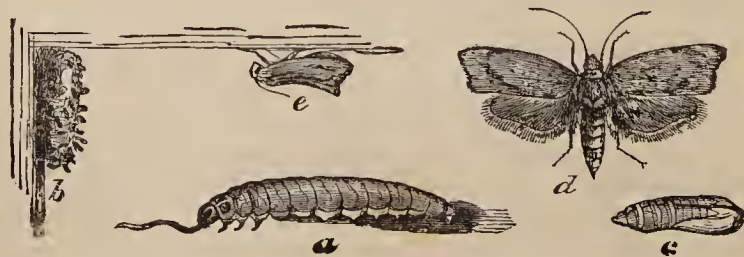
"Every time a bee stings it leaves a little barb in the flesh; if you knock that barb sideways you will knock off the bag of poison, and no hurt will result; but if you attempt to pull it out, you will just squeeze the poison into the flesh. The poison is contained in a little bag at the end of the barb."

Bees are liable to few diseases or enemies. Dysentery, as already noticed, may ensue from dampness in winter. Mr. Jones says as to bees' diseases :—

"Dysentery among bees is brought on by mismanagement. Another disease that affects bees in this country is called foul brood, a fungus that attacks the hive and ultimately affects it so badly that it becomes depopulated. Salicylic acid is a remedy. Just as soon as this disease attacks the hives, or as soon as it is discovered, the bees should be removed from the combs, starved for forty-eight hours, and put in new hives; the combs should be then melted and hives scalded thoroughly. The system of in-breeding is very deleterious to bees."

The bee moth is injurious, but only, as a rule, when the bee-keeper is negligent. Mr. Jones' remarks on that subject are as follows :—

"There are not many insects in this country destructive of bees except the moths. I think the greatest cause of destruction is ignorance in management. People allow the queen to die, and then the moths get into the hive, and they think the moths destroy the bees, whereas the fact is the queen dies and leaves the hive unguarded. If the queen dies and there are no eggs in the hive, the stock will be destroyed in a short time. If the queen is killed by accident or otherwise during the summer season, there are always eggs in the hive; but if she dies from any cause in the winter, and it is not discovered in the spring that she is gone, the moths will get in and destroy the bees."



THE BEE MOTH.

CHAPTER VIII.

GENERAL FARMING.

The term General Farming is one of very wide application. It may cover every branch of agricultural industry. It must, in such a country as this, include a great variety of ideas, systems and methods. It has its representatives of every class in the agricultural population, from the owner of the great thoroughbred stock farm to the new settler on a partially cleared stumpy lot. But the person to whom these remarks are more directly addressed is the man who carries on a system of mixed farming, working probably from one hundred to two hundred acres of land, raising just such crops as his soil seems best adapted for or his convenience demands, keeping his fifteen to twenty head of stock, and a few sheep and hogs, using the milk of his cows for the cheese factory or home dairy, and fattening two or three beasts annually for the market. Such men as these form by far the larger portion of the farmers of Ontario. While there is a very large amount of very defective farming among them, it cannot be questioned that, by no portion of the industrial population has greater progress in the last quarter of a century been made. And the best and most intelligent of their number will be the first to assent to such strictures as may be justly applied, as well as the most ready to accept any suggestions offered. In this portion of their inquiry the Commissioners have sought to bring together farmers of every variety of experience, so that out of the aggregation of testimony a common stock of information useful to all may be created. The evidence they are about to notice is contained in Appendices G, H and I.

Good Stock Indispensable to Successful Farming.

The axiom contained in the above heading will be mentally assented to by most. But in practice a great many are far too regardless of its importance. By the returns from the townships, received by the Commissioners, it appears that, out of four hundred and nine townships from which information on this point has been obtained, in fifty-three there is no improved stock at all; that in one hundred and thirteen the improvement is very slight indeed; that in one hundred and twenty-six improvement has been considerable, and in one hundred and seventeen

only has it been general. With plenty of breeders and importers of thorough-bred stock in the country, and opportunities at their very doors, there are still thousands of farmers in Ontario who have not taken the first step towards substituting for the wretched "scrub" a moderately well-bred grade beast.

That this is often the result of a penurious habit, and does not arise altogether from want of a certain amount of intelligence, is only too evident. It was stated to the Commissioners, in one instance, that persons who were offered the opportunity of improving their stock at a merely nominal charge refused, alleging that such a result would lead to the increase of their assessments. By this very absurd objection they admitted that improvement and increased value would follow, but would rather remain as they were than be so much the richer, because they might have to pay an extra dollar in the first instance, and a fraction of a cent on every dollar of increased wealth afterwards.

A more reprehensible species of parsimony was mentioned by one of the witnesses. This gentleman, a large breeder of Durham cattle, in a district where little or no improvement had taken place, had offered to sell serviceable young bulls at a very low price indeed, or to allow his bulls to serve at the smallest possible figure. But, although his neighbours would accept neither offer, they did not scruple to pull down his fence rails at night and let his young male stock have access to their yards. It could not be said in that case they did not recognize the value of the pure Durham blood.

It is, however, probable that, in many cases, farmers are really ignorant of the necessity that exists for having, not merely form and style in the male animal, but absolute purity of breed. It is not always possible for any one but an expert to distinguish between a very fine grade and a pure-bred animal. Nor is it easy to go very thoroughly or minutely, in a report intended for somewhat promiscuous circulation, into the physiological reasons why, to attain certainty of results, a pure-bred male is indispensable. The whole subject will be found very ably stated and reasoned out in the evidence given before the Commissioners, in connection with the subject of horse-breeding, by Dr. McMonagle of Prescott. No breeder of animals can breed uniformly, truly, certainly and successfully, unless he is acquainted with the theory of breeding, and the ascertained facts on which it is founded. In the evidence referred to, these facts, and the principles on which the business of the breeder should be conducted, are fully stated, without scientific technicalities, and can be understood by all who choose to read them.

It will be sufficient here to remark that the pure-bred male animal has, if in a healthy and vigorous condition, a prepotency or impressive power to stamp its own nature and characteristics on its progeny to which no other than a pure-bred animal can attain, and that too in a far greater degree than the female; that, if the latter be chosen with an eye to securing the best animal-producing medium—or machine, if it may be so termed—even from common stock,

the result is almost certain to be an offspring of the pure-bred male's type, although—even if a male—without the prepotency of its sire. If, as often occurs, the female contains any germs of animal life identical with the male's breed, then the vital powers of the latter will have a preferential affinity for those germs, and a creature still more closely allied to the male will be the result. But, for breeding, however handsome in form and promising in general appearance, the male grade, for the improvement of the stock, is all but worthless.

In the Province of Ontario, many pure-bred male animals have been imported during the last thirty years, the traces of whose progeny are lost, but the effects of whose importation remain; and if, as often happens, a pure-bred male animal of the same type or breed is introduced into the same district, the results are so beneficial as to be startling, even although the existence of any affinity be unknown.

Opinions of Practical Farmers.

So much for the theory, now for the practical view of the matter by men who are best qualified to judge. Farmers like to hear what farmers have to say about anything affecting their interests. Here, then, is what Mr. Albin Rawlings, of Forest, in the County of Lambton, not a breeder of thoroughbred stock, but a farmer, grazier and purchaser of cattle, told the Commissioners. Mr. Rawlings said:—

"We should try and impress on the farmers of the country to use none but these good animals. They always look at the cost of putting the cow, and never look to the price a steer would bring when three years old. Where I have been able to buy them, I gave a large price for these good ones to encourage farmers to raise them. The difference between the price of a common animal, a fairly well raised common steer without any trace of blood, and a good grade Hereford steer first cross, would be from one-half to three-fourths of a cent a pound. It is cheaper to give \$40 for one kind than \$30 for one of the other kind."

Turning to the evidence of Mr. Charles Drury, a well-known farmer of the County of Simcoe, he is found saying:—

"I am engaged to a considerable extent in stock raising. I keep good grade cattle, which I feed for the English market. I breed my own animals, though I would prefer purchasing and feeding if I could do so. In my breeding I always use thoroughbred male Shorthorns. Previous to the last three or four years there has not been much attention paid in my district to the use of thoroughbred animals. Previous to that time, the farmers were willing to take what they could get, so long as it was cheap, but since the English demand has sprung up, people are willing to pay two or three dollars to have their cows served by thoroughbreds."

He says, further:—

"I agree with Mr. Hobson in the opinion expressed by him that the sum realized for a well-bred steer at three years old would be \$30 or \$32 more than the sum realized for a common or scrub animal at the same age."

Then Mr. Drury goes on to give a practical illustration of his views. He says :—

“I sell my cattle for the export trade at the age of three years and upwards. Under favourable circumstances they will reach 1,600 pounds at the age of three years and six months. Within the last two years I have sold steers under four years old that weighed 1,800 or 1,900 pounds. I have been able to obtain five cents a pound for such cattle ; but the high rates for freight are against us. I have had experience in feeding common-bred scrub steers. I bought some native steers of a good average sample and fed them along with some of my own raising ; and these native steers were sold at a somewhat less price per pound, and while the steers of my own raising weighed 1,600 or 1,700 pounds, the best of these native steers went to only 1,300 pounds. They were all treated alike from the time I got them, receiving the same pasture and the same feed, and I think they consumed about equal quantities.”

Mr. Hobson's opinion, referred to by Mr. Drury, is that of another practical farmer. Mr. Hobson says :—

“I believe it would pay a farmer having only twenty or twenty-five cows, to buy a bull at a cost of about \$300. Bulls vary a good deal in the length of time they are serviceable. They usually begin to be unserviceable when they are four or five years old ; but my experience is not such as to warrant me in speaking with as much authority on that subject as some others might. A thoroughbred animal three years old and weighing 1,500 pounds, would bring, at five and a quarter cents a pound, \$78.75, while a common animal at the same age, and weighing 300 pounds less, would bring only \$48, being a difference of \$30.75. Besides, in one case you are selling a well-bred animal, and in the other case a common scrub. My experience has always led me to believe that a well-bred animal is quite as easily and as cheaply fed as a common animal ; that is to say, having the two animals, you would get 1,500 pounds of good beef at the same cost as you could get 1,200 pounds of poor beef.”

Mr. Iler, of Colchester, in the County of Essex, says :—

“In breeding I have used thoroughbreds altogether for the last few years. I don't like to use any others if I can help it. I think there is no difficulty in obtaining the services of a sufficient number of thoroughbred animals. Common bulls are very little used. I don't think it is profitable to raise a common animal to three years old, if one can be got which has one or two crossings from thoroughbred stock.”

Mr. Hiram Walker, of Walkerville, Essex, who fattens a very large number of cattle every winter at his distillery, bears just the same testimony as others. He says :—

“A sufficient supply of young cattle of the quality we need is not easily obtained. If farmers would only raise good grades they would find a beast of that class weigh, at a given age, 25 to 40 per cent. more than a common animal and be a better quality at that. Our own steers will run 1,300 to 1,400 pounds, live weight, at two years old ; that would only apply to grades. Two steers we bred, put in at two and one-half years, at three years weighed, together, 4,400 pounds. They weighed 1,600 to 1,700 pounds each when put in. Until put in they had been fed on distillery slop, with hay and grass. When put in they were fed on slop till close upon the end of feeding, if not altogether.”

Mr. John Smith, who buys and grazes a large number of cattle in the neighbourhood of Chatham, Kent, says:—

“A well-bred animal at two years old is equal to a common animal at three. We give about the same price for both, though we would rather pay more for a good grade at two years old than for a common animal at three.”

In other words, the sensible breeder of the grade saves one whole year's keep at the small cost of perhaps an extra dollar for the “service.”

Major Peters, of London, says on this point:—

“A thoroughbred steer has a better frame, is better made, and fattens much more quickly than the common steer. He will put on more beef, and it will sell at a higher price per pound. I stall feed four or five cattle in the winter, but I don't do any grazing. *No bulls should be used but thoroughbreds.*”

Mr. John Geary, of London (Ont.), another large farmer and shipper of cattle, says:—

“I could form some estimate of the comparative value of a thoroughbred steer and a common steer of the same weight in the English market. The well-bred animal of good quality will always sell for one penny a pound and sometimes twopence a pound, more than the other. Of course if you get a rough animal, even if it is well bred, the difference will not be so great. I think the discrimination is the result of real merit, as there is more beef on well-bred animals, and they cut better. They carry their beef on the parts where it is worth most per pound.”

Mr. Geary puts the case very tersely and emphatically in another place where he says: “*There is no profit in feeding scrubs.*” He gives, too, an instance in his own experience in confirmation of his views:—

“I lived until sixteen years of age on a farm, and have been engaged in farming for the last seven or eight years. I was not engaged in shipping cattle before the last two years. The animals which I buy, weighing about 1,200 pounds, are not all grade animals; some are common. I think I had about 30 or 40 head which were not Shorthorn grades; the remainder were all pretty well bred. The forty head which I have mentioned were a very low average in weight, and I lost money on them. Some of the cattle went as high as 1,600 and 1,700 pounds. Most of them were in fair condition when I bought them. The well-bred cattle more than doubled their value in the six months. I fed them almost entirely on corn, which cost me, the whole season through, \$21.26 a ton.”

Mr. Charles Simmons, Reeve of Lobo, County of Middlesex, a large dealer in, and feeder of, cattle for shipment, also gives his testimony. He says:—

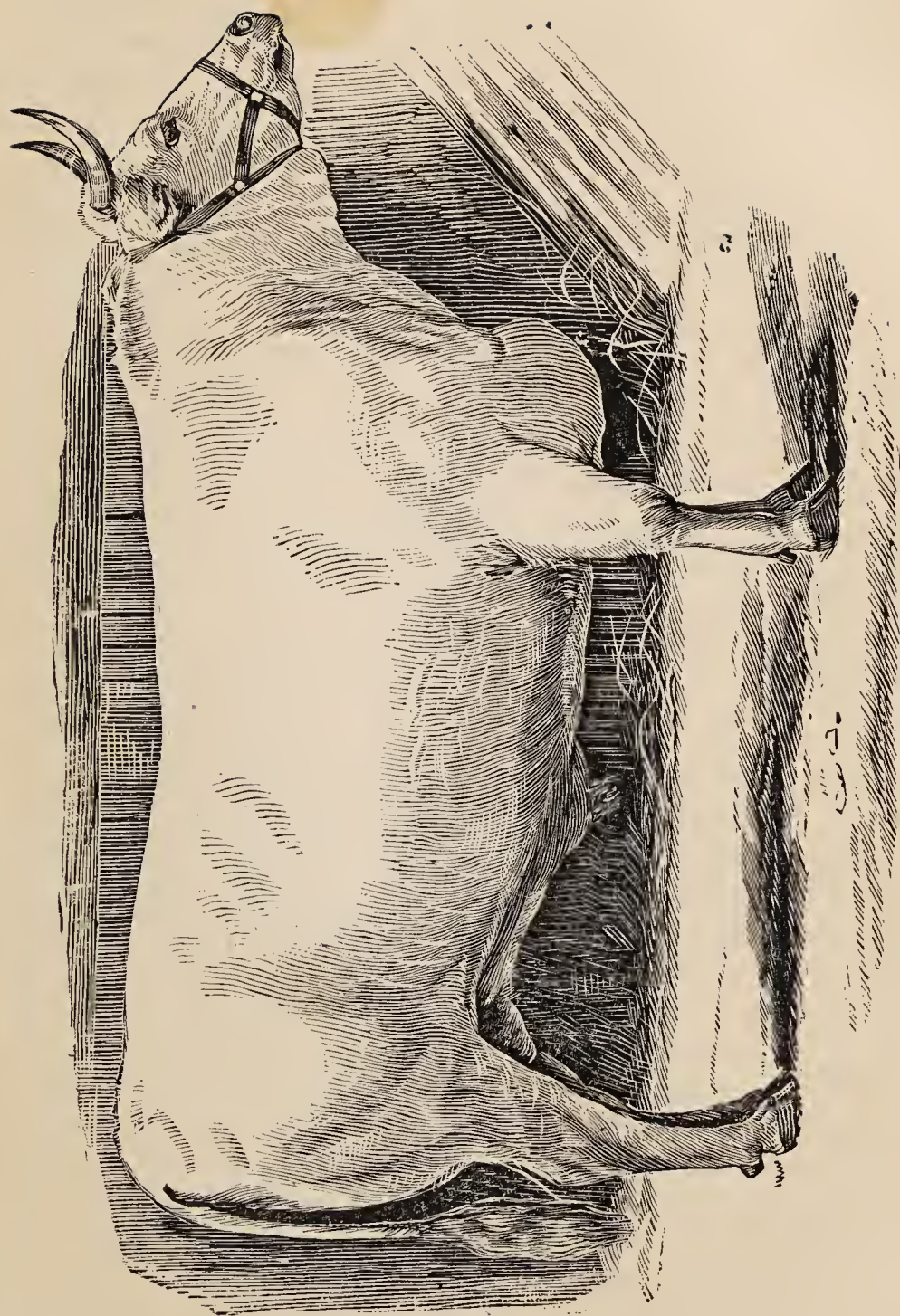
“These common cattle don't grow to the same size with the same amount of feed, and the Durham grade will be worth \$20 to \$25 more at three years old than they will. I have been engaged in my present business for about twenty years, and have handled a large number of cattle every year, so that I speak from practical experience as a grazier and shipper. For the first ten years that I was in the business I never got a lot of cattle—say 100—that would weigh 1,200 pounds each, but now there is no trouble in getting a lot that will weigh from 1,300 to 1,350. I attribute the change to the improvement in the breed of the cattle.

"Farmers used to feed them just as well fifteen or twenty years ago as now, but they could not obtain the same results. I am not speaking now of stall-fed cattle, but of cattle kept in the yards and grazed through the summer. Cattle weighing 950 or 1,000 pounds in the spring, and going out in September, will weigh 1,350 pounds. The producer of steers of 1,100 pounds, grass-fed, would require 4 cents per pound to make them pay. Cattle of the same weight, grain-fed, should get 5 cents in order to make a profit. For steers weighing 1,300 pounds he would get $4\frac{1}{2}$ cents for grass-fed, and $5\frac{1}{2}$ grain-fed. For those weighing 1,500 pounds, $4\frac{1}{2}$, grass-fed, and $5\frac{1}{2}$ grain-fed. The cost of raising a 1,500 pound steer is very little more than that of raising one of 1,100 pounds; and the reason I put it in this shape is that there is so much demand for the heavier weight, and it is easy to realize $4\frac{1}{2}$ cents for grass-fed steers that weigh that much in the fall of the year."

Mr. Armstrong, of Eramosa, County of Wellington, contributes an item in his experience. He says:—

"The only animals, besides the Durhams, which I have tried to feed are the natives. A Durham grade steer at two years old, if he was properly fed, would bring over \$80, while a native steer, at the same age and on the same amount of feed, would bring perhaps \$40 or \$50. It costs as much to raise one as the other. Last fall I bought six natives, and put them with my Durham steers, one year old, on the same feed—clover and chopped feed—and I kept them in the stable all winter, and this spring my young Durham grades came out stronger and bigger than the three-year old natives. I think there is very little profit realized on the native cattle, even if they are bought at a low price. I bought some Durhams afterwards that I paid a big price for, and I realized more money from them in about half the time than from the natives. Some of my cattle were shipped to the old country in Mr. Craig's shipment. Some large ones brought me \$140, and the common cattle that were fed all they could eat for over seven months did not realize more than \$70 apiece; that is about one-half."

As an illustration of what may be done with a well-bred animal, the recent instance of the white Shorthorn steer "Dominion Champion," will be familiar to many who saw the steer at the late fall exhibitions. The Champion was bred by Mr. E. A. Bradshaw, of Oshawa. He was calved January 10th, 1876, his sire being Barrington Butterfly, owned by Mr. J. Wilson, of Green River, Ont., and his dam Lily Dale, by Kentucky Baron, granddam Lady Jane Grey—by Romeo. While in possession of Mr. Bradshaw he lived, that gentleman states, entirely on pasture in the summer and was moderately fed in winter. Mr. Bradshaw sold him to Mr. John Russell, of Pickering, who writes as follows: "The steer was put up to feed at the age of two years and ten months. He then weighed 1,540 lbs., and when he left my place he weighed 2,840 lbs." The steer was ultimately bought by Mr. J. Holderness, of Toronto, and on the 15th of December, 1880, killed at the establishment of Mr. H. R. Frankland, of St. Lawrence Market. He was then 4 years, 11 months old, and weighed 2,900 lbs. Immediately previous to slaughtering, the Champion was carefully measured by Mr. Samuel Wilmot, of Newcastle, Ont., who gives the following as its exact dimensions:—



GREAT "DOMINION CHAMPION" SHORTHORN STEER—WEIGHT 2,900 LBS.

PHOTOGRAPHED BY NOTMAN AND FRASER.

	Ft.	In.
Length of body from crown of head to tail	7	6
Height from ground	5	2
Girth round neck	4	6
“ “ brisket or chest	8	11
“ “ shoulders	9	6
“ “ belly	10	4
“ “ loin or flank	9	7

His square measurements across his back were as follows:—

Across rump	2	6
“ hips	2	8
“ middle	3	6
“ shoulders	3	1
“ neck	1	3

Mr. Willmot adds: “His symmetry was perfect throughout—colour purely white. I notice he has taken during 1879 and 1880, no less than eleven first prizes as best fat steer, at the Dominion, Provincial, and other leading Agricultural shows.”

It may be suggested that such men as Mr. John Clay, Jr., the manager of Bow Park, are interested witnesses, but they only tell the same story as everybody else. Mr. Clay says:—

“My opinion is most decided that, if we want to produce a good stock of cattle in this country, we must use nothing but thoroughbred males. I mean by thoroughbred an animal that is entitled to be entered in the Herd Book—that has four or five crosses of pure blood—though I would certainly go farther than simply to find an animal with a pedigree; I would expect some merit in the individual animal itself. You will sometimes find a grade as good in every respect as a thoroughbred, but it has not the impressive power of a pure-bred animal.”

Nor would it be at all difficult to show that, not merely a failure to realize a profit, but an actual monetary loss must accrue to any farmer who pretends to go into the business of raising cattle for market with common or scrub stock. In his evidence before the Commissioners, Professor Brown, of the Agricultural College at Guelph, entered into somewhat elaborate calculations to show the profit and loss on ordinary farming operations. He took the two great divisions into which farming is divided—the crops on the one hand and the stock on the other. Giving credit at market rates for everything raised on the farm in the shape of crops, he showed a handsome profit. Then Professor Brown gives a comparison, drawn upon well-established data, of the advantage of a high grade animal over a “scrub.” He says:—

“As to the advantages of a thoroughbred over a common animal, I will give you the result of carefully conducted experiments on this subject, which were so regulated as to show the increased weight per head per day. A thoroughbred will

add to its weight at the rate of 1.72 pounds per day, reaching the weight of 1,892 pounds in three years, and a value of \$114. A high grade will gain 1.74 pounds per day, reaching a gross weight at the end of three years of 1,914 pounds, and being valued at \$115. A common feeding steer under the same management as the others will gain 1.30 pounds per day, or equal to 1,430 pounds in three years, and a value of \$79. Practically there is no difference between the thoroughbred and the high grade with respect to weight and value, but there is a difference of \$35 against the common animal. This is the result of a very large number of experiments, not only in Ontario, but elsewhere."

But then, what is the profit or loss on raising a grade steer to three years, and having it at that period in marketable condition? Mr. Brown shows that, *charging it with everything it consumes at market rates* (the same figures that he has credited to crops), there is an apparent loss of some \$70. Against that, however, adopting again a well-understood rule or method, he shows that the actual value of the manure of the animal (which has been previously charged by him to crop-raising account) is just \$69.50, or as nearly as possible a set-off to the assumed loss. His own words on this last point are:—

"This brings us to the question as to the value of manure, as against this apparent loss of \$70. What I have to say on that subject I will make very short by remarking that the value of the manure produced by an animal, from its birth to the age of three years, is, at the least, four cents per pound for every pound the animal then weighs, and, in saying that, I am giving the experience not only of Ontario, but the experience of Europe for the last fifty years. That comes to \$69.80. Then there is the advantage of obtaining that manure as a certainty, which could not be depended upon unless from such a source."

Now, a scrub animal will eat as much as a grade, or more, and makes no more manure. So, if a grade only just balances the account with its owner—as Professor Brown puts it—every scrub raised would inflict on its owner a loss of not less than \$35. Professor Brown's figures will be noticed more fully hereafter. They are only now referred to in so far as they affect the present argument.

Demands of the British Market.

The matter, however, does not end here. The hope of the farmer is in a foreign market for his cattle. Except for thoroughbreds for breeding purposes, the trade in cattle with the United States is much reduced; but the trade with Great Britain has come to the rescue of the Canadian farmer. In 1873, not one beast was shipped to Europe from Canada. In the year ending June 30, 1880, Canada—chiefly from Ontario—shipped to Great Britain no less than 32,680 head of cattle, besides 110,143 sheep; and in the calendar year 1880 not less than 50,000 head of cattle—a trade in cattle and sheep with Britain alone, representing a money return of not less than \$5,500,000 per annum, and still in its infancy.

Every farmer to-day knows that this is the trade he has got to work for and

rely upon, for the disposal of his surplus stock. But what do Mr. Wiser and other large shippers and buyers tell him? What the great western graziers say, has been already noticed. Mr. Wiser, after referring to the figures just quoted, remarks:—

“This enormous increase of exportation of Canadian cattle, as compared with the previous years, shows that our farmers are more alive to the importance of stock-raising, and of improving the quality to the standard required for the English markets.

“The success which has thus far attended the exportation of Canadian cattle, gives great encouragement to farmers to pay still more attention to stock raising and improvement of breed.”

And what are the cattle Mr. Wiser, a buyer of 1,100 head annually for distillery feeding, wants? He says:—

“For feeding purposes, good grade Durham or Hereford steers, three and four years old, weighing from 1,100 to 1,200 lbs., are the most desirable, and distillers ought not to feed any lighter cattle.”

Another large shipper, Mr. Morgan, of Oshawa, says:—

“There is 50 per cent. difference in the value of a common grade steer and that of a well-bred steer; in fact, *I would not ship a common-bred animal at all, if I could help it. It is of no use to ship a poor animal to England.* . . .

“I have shipped native stock. I did not find it profitable to ship them, even under the best circumstances. I would rather pay six cents a pound for a well-bred animal than four cents for a common animal of equal fatness. You require style and quality combined for the English market. The texture of the beef is better, the fat and lean are more mixed up, and the bone is smaller in a well-bred animal than in a common one.”

Mr. Britton, of Toronto, a man of very large experience in handling cattle, says:—

“There is a great difference in the quality of cattle, and we do not give anything like the highest price for common cattle. You may attend twenty fairs in the back country, say on the line of the Northern Railway, and among the 800 of all sizes, ages, and shapes which you may see, you could not select twenty-five that would pay their expenses to Europe. They are generally large enough, but are mere masses of coarse, inferior, tough, and insipid meat. They cost just as much to raise as a thoroughbred animal—in fact they consume far more food. We buy common cattle at from two to three cents per pound in the fall, to make ‘chased’ or peddling beef. This beef is sold for \$9 per barrel, and the labour costs \$2, leaving \$7 for the beef. It is mostly used by the fishermen of the Lower Provinces.”

Mr. Britton mentions, too, an experiment he had once used to test the respective economical values of common and grade cattle. He says:—

“In 1873 I bought 103 common native cattle back of Peterboro’; they were three years old, and I thought I would try an experiment with them. I tied them in two rows and gave them all the hay they wanted three times a day. I also gave them corn and bran mixed. I put them up in November and fed them seven months. Next to them I put two rows which I bought near Goderich—all grades. I bought the first lot for 2½c. per pound, and the others at 3½c., and 3¾c., live weight. I also fed them seven months. The common cattle required

more food, for they were always eating; and during the seven months all they gained in gross weight was 130 lbs. each. The grades gained 270 lbs. each. They were about the same age and the same weight as the others. I sold the native cattle to the Americans for \$4.63 per hundred pounds, live weight; and I got \$5.37½ for the grades."

American Competition.

Mr. A. J. Thompson, another large shipper of cattle to Europe, was one of the first witnesses to point out the vital importance of Canadian farmers shipping stock of the highest quality in view of the severe competition to which they are subjected by the vast numbers of improved corn and grass fed cattle of the Western States. He says :—

"The animals that come from Kansas City are far superior to Canadian grain-fed cattle—there is no comparison between them. People have the idea that there is no breeding among the cattle in the Western States, but it is a great mistake, for these cattle are all pretty well bred. The Texas and Cherokee native cattle have all been done away with, and every year they are taking into the country the best blood they can get."

The large sales of Canadian thoroughbred Durhams and Herefords to Western breeders and ranche men show what is going on in the great American feeding grounds.

And from across the Atlantic comes exactly the same warning. When Mr. Richard Hall, the well-known cattle salesman of Liverpool, was here, during the past summer, he was invited to give evidence on the trade in cattle with Great Britain. He did not say "send us good native cattle." Nothing would have seemed to him more absurd than an attempt to maintain the trade with such materials. His whole idea was a first-class grade beast. What he says is :—

"There are a good many common beasts among the Canadian cattle devoid of good breeding. . . I would advise Canadian breeders to send to England none but good animals. . . Assuming that your farmers pay great attention to getting a high class of animals, thoroughly well-fed beasts, stall-fed ones, you will command as good a price for them in our market as other English breeds."

And then he points out the character of the American competition by saying :—

"Many of the cattle (American) I am speaking of are good grades—what we call a real good, useful butcher's bullock. They have bone; but you cannot get flesh without bone. If you get weak necks you will have weak chines. These cattle are animals that have been greatly improved by the use of thoroughbred Shorthorn bulls."

Finally, in the report of Mr. Richard Gibson, one of the Commissioners, of his visit to England last year (published in Appendix S), he says of the buyers in that country :—

"Unanimously they all speak out loud 'Why don't your people use better bulls? We know that you can grow as good cattle as can be found anywhere, for we have seen some sell in public this spring for £45 each, but not one in ten

of the ordinary stock you send has paid for his keep. Send them of good quality and breeding, and then, if any accident happens so that they are bruised too bad to slaughter for market, they will sell for all that they are worth to be grazed for a few weeks, but no English grazier would ever think of buying such rough, coarse specimens as most that you send, and if your farmers had to pay rent for, instead of owning their farms, they would soon be compelled to breed better stock.”

If a Canadian farmer were raising cattle for his own market alone, it would be only commonly prudent to keep none but improved stock, whether he looked to fattening a steer, or heifer, or now and then had occasion to turn a dairy cow into beef. But if he looks, as he must look, to the British market as his standard, he is, with common cattle, hopelessly behind, and while his wiser neighbours will be getting their \$75 to \$80, or even \$100 for a good grade beast, he will be left to go a-begging to the local butcher to relieve him of his rubbish at the latter's own terms. It is painful to read the evidence of Mr. Britton, and others, in which they describe the difficulty of selecting even a few beasts fit for shipment, out of large numbers at fairs and other places, and to reflect on the terrible loss of opportunities represented by the hundreds rejected.

General Advantages of Improved Stock.

Nor is the direct pecuniary gain on a good grade beast, as compared with a “scrub,” the only advantage the farmer receives by introducing improved stock. Everybody has heard stories written for a moral purpose, of the first reform in an unthrifty or uncleanly household being brought about by one of its youthful members being sent by his teacher to wash his face and hands at the school pump. It is not too much to say that the initial step towards really good, thrifty, and profitable farming is to be found in the outlay of the first two or three dollars on the service of a thoroughbred bull. From that moment the farmer has something worth caring for, and which will respond to his care. It is not very satisfactory to read that forty-seven per cent. of the farm buildings of Ontario are of an inferior character. But men that breed improved stock will find it is unprofitable to keep them in straw yards, or open sheds in the winter, or in draughty barns and byres, with the winds of heaven whistling about their flanks and converting their coats into imitations of the hedgehog or porcupine. Good stock will pay for good housing.

But they will pay for good feeding too. The whole subject of feeding will be noticed further on. Meantime, as bearing on the subject just now in hand, the following remarks of Mr. L. Parkinson of Eramosa, County of Wellington, may well be quoted here:—

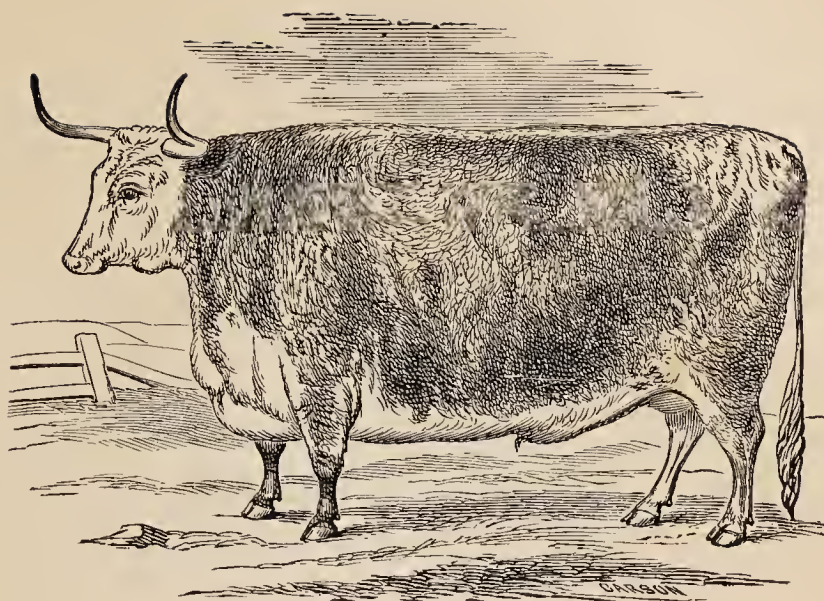
“If a farmer wants to keep up the quality of his farm he must feed his coarse grains. Without going into figures, or making any calculation, I can say this: that, in our neighbourhood, all the men who have raised turnips and who feed their coarse grains and hay on their farms, and have occasionally bought a little bran and other kinds of food, have done well. I don't think any of these men have

got mortgages on their farms, but some of them have got mortgages on other people's farms. I want to say this, also : an idea has got abroad that so much of the land in Ontario is so badly farmed that it has become much exhausted and run down. I think that it is true in reference to a large proportion of the land. People who sell their hay and coarse grains, and who do not properly cultivate their land, have their farms in a pretty bad state, and between the wild mustard, Canada thistles, and other weeds, have their farms pretty full of flowers at this season of the year. But those who have raised cattle, and sheep, and hogs, and in that way consume their coarse grains, and apply all the manure they can to their lands, have farms which, in my opinion, will grow now as good crops as they did twenty-five or thirty years ago, all other conditions being equal."

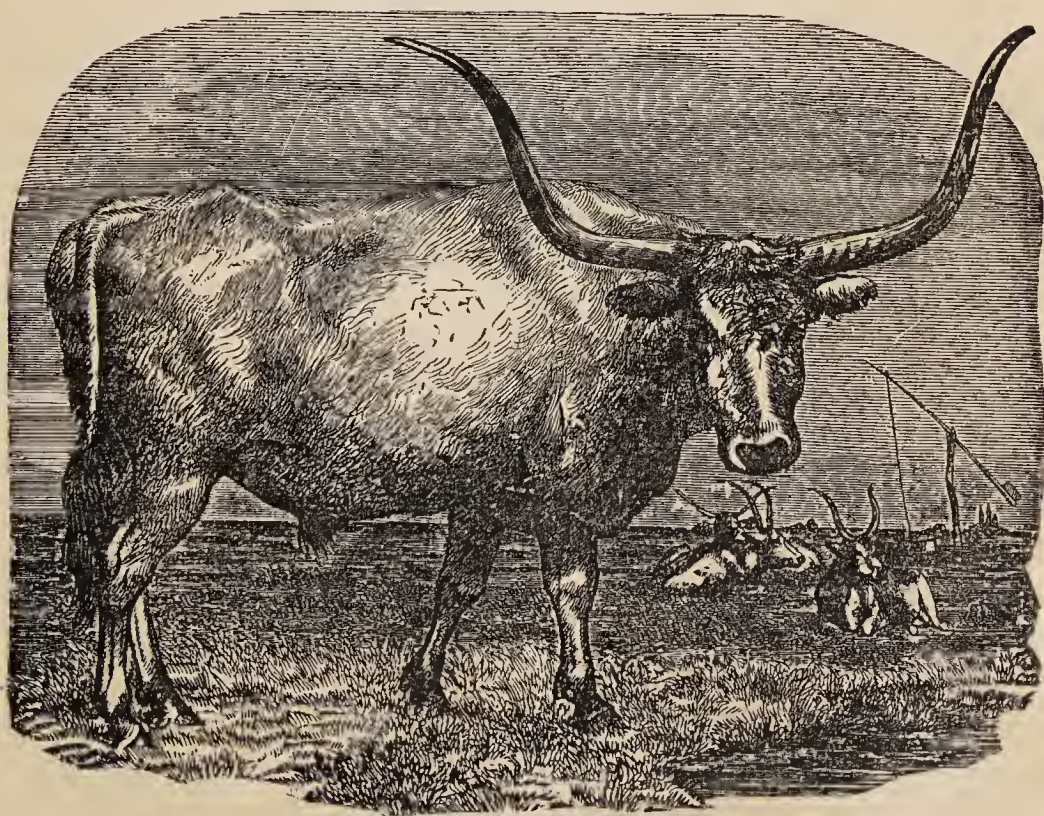
The farmer begins to grow roots and coarse grains and feed his stuff to his own cattle when he raises his cattle with an object, and has stock worth caring for. Good feeding is the first necessity of good stock, and good stock means above everything good farming with all that the phrase implies. It is true that the men of the past generation and some of the present, with a virgin soil to depend upon, have done well with very common stock. But the time has come when farming, to be successful, must be carried on upon new methods and under new conditions. Adventitious advantages must be depended on no more. Skill, energy, a readiness to avail of every new idea worth utilizing, are the only reliance of a sensible man now-a-days, and the first thing a sensible man will do if he has not done it already, will be to improve his stock. A pictorial illustration or two will perhaps help him to the conclusion as to which side he will incline in the trial of beef *versus* bones.

Cost of Thoroughbred Bulls.

The cost of purchasing thoroughbred bulls has frequently, it may be supposed, had something to do with the reluctance of farmers to adopt a course attended with such obvious advantages. Formerly the expense was much heavier than it is at the present time. In some districts visited by the Commissioners, the Township Agricultural Society had very wisely expended the Government grant in purchasing thoroughbred animals for the use of its members. In many cases a farmer finds the investment of his own money in such a way profitable, not only so far as his own stock are concerned, but also by reason of the fees he receives from his neighbours. After all the outlay is not great. Mr. Hobson thinks that it will pay a farmer with twenty or twenty-five cows to buy a bull at a cost of \$300. But there is no need to go to so high a figure. Fashionable colours and other points are all attractions to breeders of thoroughbred stock, and enhance the value in that way, but they add nothing to the intrinsic merits of the animal. The average price realized by Mr. Clay at his last auction sale of Bow Park cattle in the States was \$311 per head. But the Bow Park herd is largely of the Bates Shorthorn breed, which is very much in demand in the States, where people, too, pay higher prices than here. Mr. Hunter, a witness before the Commission, says :—



BEEF.



BONES.

"It would pay a farmer with no more than six or eight cows to buy a good bull. If, for instance, a man with 150 acres, who followed mixed husbandry, bought a yearling bull for \$150, it would be some time before he would make his money simply from the service of the cows; but at the same time he must consider that he will realize the greater portion of the money he paid for the bull by fattening it and selling it afterwards on the market as a beef animal—say for \$100. Say that the bull served ten cows—that would be equal to \$30; and his service for one year would be equal to his keep. I consider that in the first season he would improve the native stock one-third."

Mr. Watt, another very successful breeder of Durhams, the breed Mr. Hunter also refers to, says:—

"We have been getting from \$100 to \$200 for bulls twelve or fifteen months old. I do not think a bull three years of age so sure as a younger bull, although it depends very much on circumstances whether a three-year old bull is useful or not. I think 60 or 70 cows are plenty for one bull during the season. If he is not used more than that, he should last until he is six or seven years old, without losing any of his prepotency."

Mr. Benson, of Cardinal, says:—

"A thoroughbred bull is ready for use at the age of twelve or fifteen months. I could sell you four fit for breeding at from \$60 to \$100, and I could sell you a dozen not yet fit for breeding at from \$30 to \$40; I sold one of the best this year, when dropped, for \$25—that was on the very day it was calved. For stock purposes, these are quite as good as the bulls Mr. Clay spoke of as being worth \$300. When I sold those forty animals, I weeded out of my whole herd everything that was at all of a common nature, and all my animals are at present from imported stock, either from Kentucky or from England. I have generally sold all my good bulls in the United States. I have sold them as low as \$100. The buyers come over to me and get them."

If the Hereford breed be preferred, they can be had at about the same price, although Mr. Stone of Guelph, famous as a breeder of Hereford cattle, says that owing to the demand for Hereford bulls from the Western States, he sold nothing in 1879 under \$200.

Mr. McCrae of Guelph, sells his Galloway bulls at from \$50 to \$200 "according to the quality of the animal, and the desire of the purchaser to possess it."

Of Devons, Mr. Rudd of Eramosa, says, he has obtained \$220 for a bull calf but that would be a specially attractive animal, for Mr. Courtice of Darlington Township, sells Devon bulls of a serviceable age at from \$50 to \$100.

Of Ayrshires Mr. Jardine makes a rule to sell nothing under \$100, the price ranging from \$100 to \$200. Mr. Laurie can sell a good two to three year old Ayrshire bull for \$100.

All the animals above referred to are, of course, pedigreed, and, while a record of pedigree alone should not be sufficient, and every buyer should use his own judgment as to the points and quality of the animal he is invited to purchase, a properly certified pedigree should always be insisted on.

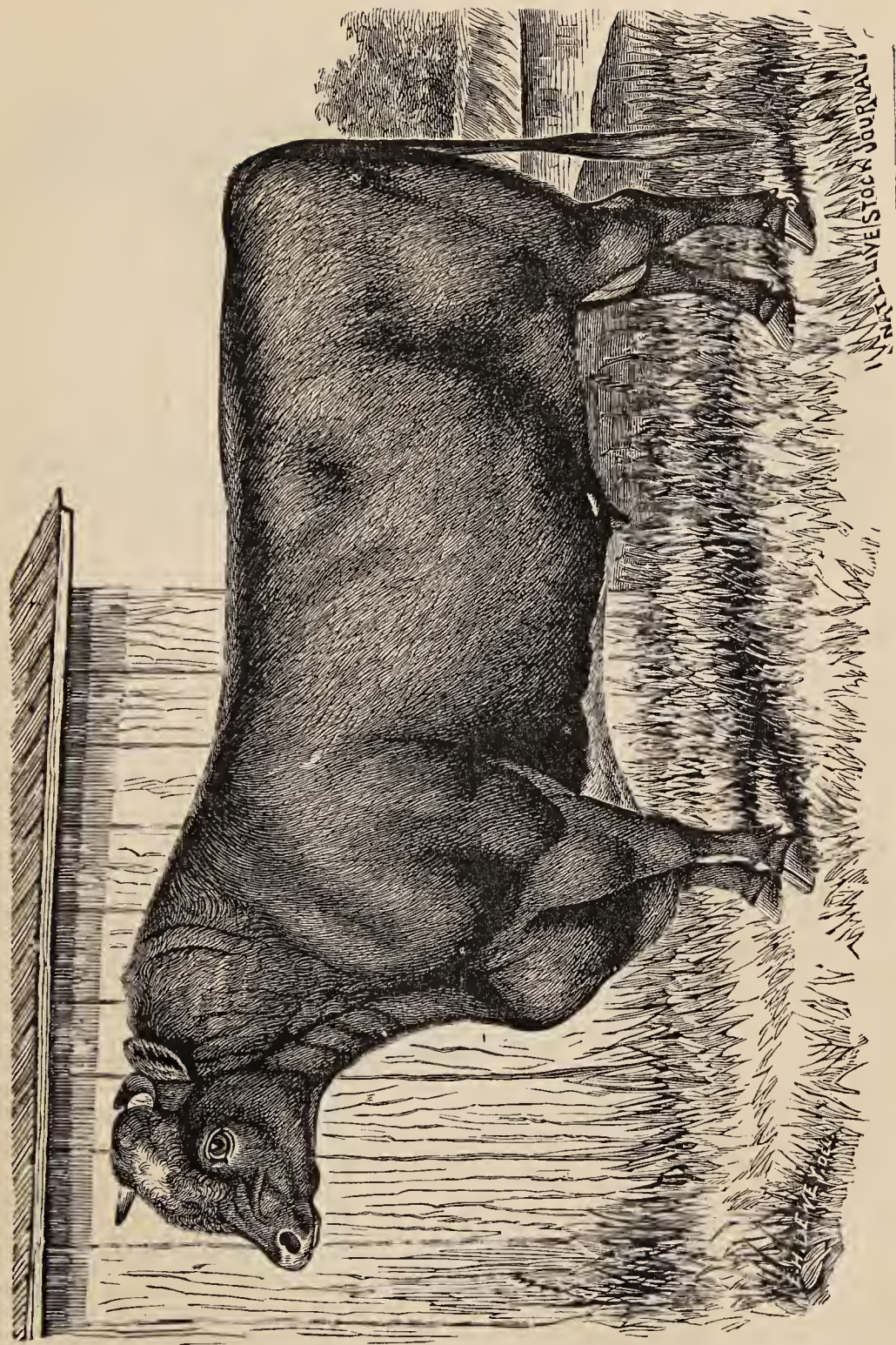
Various Breeds of Cattle.

What has been said hitherto, as to the necessity of using thoroughbred stock, has applied to no particular breed or family. The respective merits of the several breeds referred to in the evidence, have now to be considered. And, here again, it might be well to remind the reader of these notes that the question present to the mind of the Commissioners, has not been to what point or points of excellence in any one or more particulars any one breed may attain, nor yet to which breed belongs the prize for beauty, docility or any other special attraction—but which is the best breed or which are the best breeds for improving the common stock of the country, having a due regard to the ordinary requirements of the Canadian farmer, as already described. The Commissioners were extremely desirous to obtain all the information they could on this point, not only by taking the opinions incidentally of farmers examined, but by inviting the attendance of breeders of the several varieties at Toronto, and by holding a special sitting at Guelph, the centre of a great cattle-breeding district. They have also—since the sittings of the Commission terminated—received by correspondence some additional evidence of a documentary character respecting breeds not directly represented before the Commission. An endeavour will now be made to reproduce fairly the salient points in the whole mass of testimony.

The Durham or Shorthorn.

The Durham, or as it is more frequently and popularly termed, the Shorthorn, is by far the most numerously represented breed in Canada, or on this continent, as well as in Great Britain. That fact alone if it does not attest the supremacy of the breed absolutely, certainly establishes it by inference. But, the true position and value of the Durham will have to be shown by actual facts as set forth in the evidence. Mr. Clay of Bow Park, puts the case of the Durham as follows :—

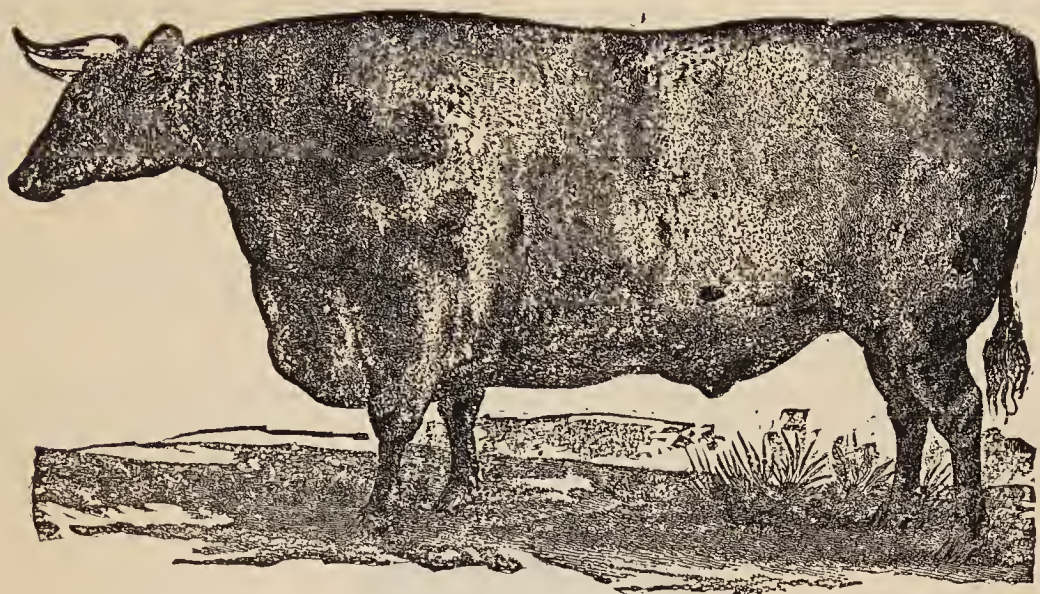
“The combination of blood that produced the Shorthorn has not been discovered. It is supposed that the Shorthorn originated two or three hundred years ago in Teeswater, and those Teeswater cattle were long looked upon as the best race of cattle in England. About the latter end of the eighteenth century the Brothers Colling, among other breeders, took up this class and improved it. The bull to which most of the cattle of the present day owe their superlative merit is one called ‘Favourite (252).’ After the days of the Brothers Colling, and building upon their foundation, came Bates and Booth ; and they, by a continuous process of in-breeding, have been able to raise the Shorthorn to its excellence in the present day. There are legends connected with the Shorthorn which it is scarcely of any use to refer to now ; a great deal concerning its origin is based upon mystery, but it no doubt owes a great deal of its excellence to the Brothers Colling. The system of in-breeding, though producing good results in the case of the Shorthorn, will not do for all animals. ‘Hubback’ was the bull that originated the family of the Duchesses.”



PURE SHORTHORN BULL, 20TH DUKE OF AIRDRIE.

THE LIVERPOOL JOURNAL

The celebrated Ketton ox, bred by Charles Colling in 1795, would not stand much chance in the ranks of competitors to-day, but was a wonderful advance upon the ordinary cattle of that time.



KETTON OX (DURHAM), 1795.

The difference in form and finish between the Durham of 1795 and the Durham of to-day will be seen by a comparison with the “model steer” of the accompanying plate.

The opinions of Mr. Benson, given at various points in the course of his evidence are expressed as follows:—

“For improving the common stock of the country I like the Shorthorn. I think Shorthorn beef is as good beef as you need want, and prefer the Shorthorn for farmers’ use. I have kept distinct herds of Ayrshires and Shorthorns, and I have crossed the bulls of both breeds on the common stock, and I like the cross from the Shorthorn very much the better, even for milking purposes. For the necessities of the country, I think the Shorthorns are altogether the best cattle. . . . Taking milk and meat together I think the Shorthorn is the best. . . . In the Shorthorn I think you combine every desirable quality.”

Mr. Jno. Miller, of Brougham, one of a family known throughout the Province as standing in the front rank of its agriculturists and importers of thoroughbred stock, says:—

“The best breed of cattle for the use of the ordinary farmer of this country I think, is the Shorthorn. Some families of them are very good milkers. I have had very good milking Ayrshires, but I have known some of the best families of Durhams to give more milk than they would. I think it is best, in breeding cattle, to endeavour to combine the two qualities of milk and beef. I have known grade cattle to be very good milkers—crosses of Shorthorn bulls and Canadian cattle are just as good as the Ayrshires for milking purposes. I think it is very injudicious for our farmers, if they want to get cattle either for beef or milk, to use any other than thoroughbred males. If they want to act for their

own interests, they will have a full bred animal, and a good one at that. I would look for a good animal before I would for a pedigree; though if a good animal has a good pedigree also, he is so much the better."

Mr. Charles Drury says:—

"I am engaged to a considerable extent in stock raising. I keep good grade cattle, which I feed for the English market. I breed my own animals, though I would prefer purchasing and feeding if I could do so. In my breeding I always use thoroughbred male Shorthorns."

Mr. Dickson, of Tuckersmith, "looks upon the Durham as the best animal for the country."

Mr. Matheson, of the town of Perth, who had particularly in view the dairying industry of that district, commenced his improvements with an Ayrshire bull, but exchanged it for a Shorthorn. He says:—

"I wanted to get an animal that would be good for dairy purposes, and that could also be fattened for beef, if anything occurred to destroy the milk properties of the cow. The Shorthorn cross has turned out very well, and I am only sorry that I did not begin in the first place with the Shorthorn."



Fat Shorthorn Heifer, "ICICLE," the Smithfield Champion of 1878, whose total winnings in prizes amounted to \$3,212.50.

Mr. Stephen White, of Charing Cross (Kent), says:—

"I prefer the Shorthorns to all other cattle. I have tried Galloways. I have two thoroughbreds of that breed, a bull and a cow. They are good to stand the winter, probably equal to our native cattle; but to improve our stock the Durhams are altogether to be preferred. The Galloways might be useful under some

circumstances. As beefing cattle I find they are an improvement on our native cattle, but a cross with the Shorthorn is better."

Mr. Stedman, of Drummond Township (Lanark), says:—

"I approve the use of the Durham, because, where the milking fails, the cow can be fatted for beefing purposes."

This, in fact, appears to be the prevailing view of many farmers. What can be done with a Shorthorn heifer if found useless for dairying may be judged by a glance at the illustration on the opposite page.

Looking mainly to a beefing animal for the British market, Mr. Wiser says:—

"With reference to cattle, that which we want, in order to meet the demands of the English market, is an animal as nearly as possible to the thoroughbred Shorthorn. There is no other class worth talking about. There are other good cattle, such as the Polled Angus; but I don't think we could get the difference in price between the Polled Angus and the Durham to compensate for the difference in weight. There is no doubt the Polled Angus is much desired in England; but for the demand generally, the Shorthorn Durham is the thing."

Professor Brown's testimony is:—

"Beginning with the famous Durhams or Shorthorns, I would say that either for beef or for milk, I do not think there is anything that can equal them. I say this advisedly, after many trials of the different breeds. They may not do so well as some other breeds on poor pasture, but for improving other breeds, and for early maturity and weight in itself, I do not think there is anything in the hands of man at the present time to excel the Shorthorn."

Mr. James Hunter gives his views in the following evidence:—

"I prefer the Booth family to the Bates. My principal reason for this is that when I went first to the old country, I knew nothing about either of the families, and I went to see some noted animals on both sides, and I saw at a glance that in the Booth animals we had the advantage in fleshing quality, and I thought that was what we wanted in Canada. So I selected them on account of their feeding qualities. I have bred principally from the Booth; I have not crossed with the Bates since I commenced to import. In purchasing, I looked to the animal as well as to the pedigree. We have not paid such fancy prices as some persons, but I certainly think a few hundred dollars are not lost if they are paid for an extra pedigree. You must have a good animal as well as a pedigree, and I think you should look considerably to the immediate ancestors of the animal itself.

"For all practical purposes, I consider the Durham ahead of all other pure-bred cattle. I consider them best adapted for improving the common stock of the country. We have found a ready sale for all the bull calves we could raise we have never had to fatten a bull for the want of a market since we commenced."

Mr. Armstrong, of Eramosa, says:—

"I think the Durhams are the most profitable animals we can import into this country. You may take a Durham and cross it with another animal, and you will get an improvement on that animal, but you cannot get any improve-

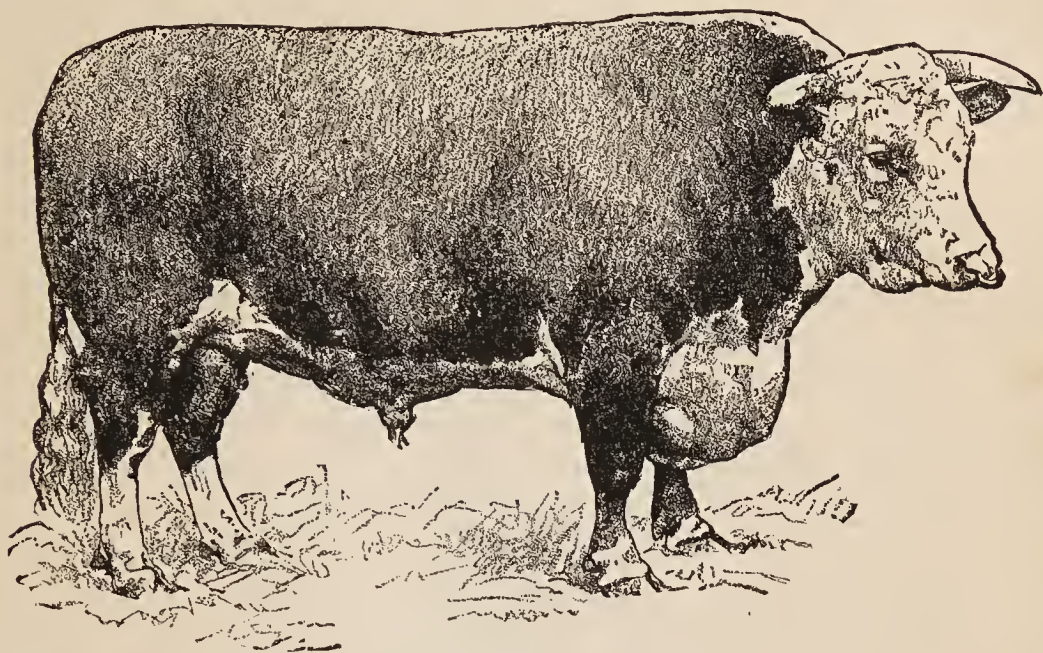
ment on the Durham. I think them the best breed to cross on the common stock of the country."

"For the British market," says Mr. Morgan, "I would recommend farmers to produce nothing but the Durham." Mr. Simmons, in connection with grazing, thinks the Durhams gain most and are the best cattle. Mr. McArthur, another large grazier in Middlesex, says:—"The Durhams have improved the stock most, both for fattening purposes and as milk cows for farmers." Mr. John Geary, of London, "prefers the Shorthorn," and says:—"To suit the market in Britain, I would recommend the farmers in Canada to produce Shorthorns." Major Peters, of London, while much attached to some other breeds, "prefers the Shorthorns for breeding good grades." Mr. John Smith, of Chatham, "for shipment, prefers from one-half to three-quarter bred Shorthorns." Mr. Hiram Walker, already referred to as one of the largest feeders of stock for shipment, says:—"We use only the Shorthorn for improving our stock." Mr. Richard Hall, of Liverpool, England, is a salesman, not a farmer, and speaks of the animal solely from a salesman's point of view. Of the business of breeding he does not pretend to know anything, except as regards hogs, in which he has, as an amateur, done something. But he says:—"For the purpose of getting good grades I would recommend your farmers mainly to cross your native cattle with Shorthorns," his opinion of the Shorthorn being no doubt largely formed from his knowledge of its all-prevailing popularity with the breeders of Great Britain.

The Hereford.

However numerous the champions of the Shorthorn or Durham, no animal has warmer admirers than the Hereford. Even some of those who give judgment finally in favour of the Durham, do so with the admission that the effort is a hard one, and the word reluctantly spoken. Among the Hereford breeders in Ontario, Mr. F. W. Stone, of Guelph, stands foremost. He began to import them in 1860, and had, when examined by the Commissioners, a herd of 120. Mr. Stone is also a breeder of Durhams, and has, of the latter, even a larger herd than of the Herefords. He is no prejudiced bigot in favour of one breed or another. "I have no question," he says, "in my own mind as to the great utility of the Shorthorn as a means of improving the stock of this country; at the same time the Herefords have not been used in this country to the extent that they ought to be." The views of such a man are therefore entitled to great weight and respect. Mr. Stone's evidence, in fact, leaves very little to be said by any one else in this particular connection. As to the hardiness, early maturing qualities and weight of the Hereford, on the same food at a given age, he considers the Herefords equal to the Durhams. As to their milking qualities, he alleges their milk is richer than the Durhams', and as plentiful in a given period, if not at one time. He goes on to speak of their being the best grazers of any existing breeds and says:—

"If I had a three-year-old Durham grade, and a three-year-old Hereford grade in the spring, and they both weighed 1,500 pounds, and if I put them out at pasture on the first of May, I think the Hereford grade would come out on the 1st of October in better condition than the Durham. The Hereford would give more prime beef and less offal. When they went to the shambles the Hereford would give better cuts."



PRIZE HEREFORD BULL.

As a proof of the value of the Hereford as a grazing animal and a close feeder, Mr. Stone says:—

"The demand in proportion has been greater for Herefords than for Durhams during the last two or three years. That is owing to the demand which has sprung up in the west for cattle for grazing purposes.

"These cattle are taken out west, to Colorado, Texas, Kansas, and other States, to improve the common stock. The age at which these cattle are purchased depends on where they are going to. The Texas and Colorado men would like to have them at from ten to eighteen months old. We sold nothing last year under \$200. What makes these people prefer the Hereford is that they can get half a cent a pound more on the market for the steers of the Herefords than they can for Durham steers.

"The difficulty with the Shorthorn is that it gets too bony and too tall. In these western countries they have nothing but pasture, and the Hereford thrives better on it than the Durham.

"Eight or ten years ago a gentleman came over here to buy a car load of Shorthorns. I sold him several heifers and bulls, and I urged him to take a Hereford out with him; at first he would not hear of it, as Herefords at that time were not in so good demand as they are now; but finally, at my recommendation, he took a heifer and a bull; and I got a letter from him last year, and he said that from that heifer he had about thirteen female descendants, that there was such a demand for half-breed Hereford bulls that he could not supply it, and that he was then breeding about 500 heifers. In Kansas city, this gentleman told me, he gets half a cent a pound more for the half-bred Hereford than for the half-bred Durham. The cattle are not stall fed; they are all grass fed on pasture."

In conclusion, and after being pretty closely questioned, Mr. Stone said :—

“I think the Hereford would mature a little earlier, at the same cost, than the Shorthorn, although the latter would be the larger animal. I could not say which would ultimately be the finer beast, if you went on feeding them for four or six years, as it would depend on whether people would prefer weight or shape. The Hereford is rather a smaller boned and more compact beast than the Durham at the same weight. I think the Hereford would be as heavy at three years old as the Durham of the same age and upon the same feed. I think a grade Hereford at three years old would be equal to a grade Shorthorn of the same age, upon equal feed.”

Mr. Stone's views found a very warm seconder in Mr. George Hood, also of Guelph. He is intensely enthusiastic in favour of the Hereford, and perhaps would do more for his case if he were to present it rather less fervidly. For instance, he says :—“I never had a Hereford that did not come out with the highest honours in the ring; I have shown them along with other breeds as breeders, but the Durhams generally beat them—prejudice beat them.” The gratuitous boast only led to the subsequent confession that the “highest honours” were unsubstantial. Whatever the value of the “highest honours,” it was the Durhams that took the prizes. Nor, if an exhibitor chooses to place himself in the hands of judges, is it fair for him to allege that only “prejudice” has guided their decisions, because they happen to give his exhibits only second place. But, as a matter of fact, the Herefords need no boasting, for being serviceable cattle of a very high order indeed, their friends need fear no detractors. It may be an open question whether the prepotency of the Hereford male animal is greater than that of the Durham, although Mr. Hood has settled it affirmatively, once for all, in his own mind, and no doubt most conscientiously believes it. But, on some points, he is quite in harmony with the testimony of others. He says, for instance :—

“If you put a Hereford and a Durham steer on pasture, the Hereford would be far ahead of the Durham in the fall, as a general rule. It is the exception to get a Durham that would at all feed in pasture beside the Hereford. I have no doubt of that, both from my own experience, and from what I have seen in the cattle that I have bought from others. I have not bought many Hereford steers of that character, because they are not extensively gone into. . . . I was speaking to-day to Mr. Goodfellow, a townsman, who is shipping for the European market. He buys in the States, and he said to me, ‘you should have seen some half-breed Herefords that we got from the State of Maine; I had some on the last shipment, and you never saw anything like them.’ I asked him if he liked that kind of cattle, and he said, ‘I get all I can lay my hands on.’”

As a butcher, too, Mr. Hood has an experience that is valuable. He says :—

“There is one difference between the Hereford and the Durham which is a very great one. We have not killed many pure-bred Herefords in this country—they are too valuable; but in slaughtering, you can take out the paunch of a Hereford steer with one hand, while you have sometimes to get two men to pull out the paunch of a Durham. The Hereford carries his beef on the most valuable parts. He is superior to the Durham on his back and loins, and is very much superior

in the hams and the crops, as well as in the plates and inside the ribs. You will sometimes get a Durham with a heavy rump, and a tolerably good back, but if you look down along the ribs, you will find that it is blue and poor. I have slaughtered and handled a good many first-class cattle in the Dominion. Taking a Hereford grade steer and a Durham grade steer at three years old, and fed on the same amount of feed, I think the Hereford would outweigh the Durham, because the Durham requires more feed to keep up its constitution. I have had first cross Herefords, both heifers and steers, and they were as good cattle as I ever saw. I saw two yoke of oxen, cross-bred Herefords, at the Centennial Exhibition, bred by Mr. Burleigh, State of Maine, from a bull of Mr. Stone's stock, that weighed over 2,700 pounds each."

When some of the Commissioners were in Muskoka, they met with Mr. E. G. Muntz, of Alport, on the Muskoka river, near Bracebridge. Mr. Muntz owns a herd of Herefords, having selected them after some experience with the Durhams—although perhaps not a very long or severe trial—as especially adapted to that new and somewhat rough country, where the pasturing of cattle is likely to be the chief branch of agricultural industry.

The favourable opinions expressed as to the value of the Herefords as grazers, are very strongly confirmed by the evidence of Mr. Albin Rawlings, of Forest (Lambton), already mentioned as an extensive cattle grazier. Mr. Rawlings says:—

"There is no doubt in my mind that the Herefords are better than the Durhams. The Americans are getting our best male Herefords, and our farmers are losing by it. Some of our agricultural societies have not properly encouraged Herefords. There are a large quantity of Herefords in Quebec now. They are becoming popular more and more, and are being shipped very fast. Their merit is that they are hardier and keep in good condition. When they are milking they keep in good condition, and after they become dry they are beef in about two months. I had half-breed Hereford cows this summer that put on more flesh in six weeks than any other breed I had did in nine weeks. They are very fast feeders on pasture.

"I had Durhams and Herefords together in the same pasture this year. On pasture the Herefords get far ahead of the Durhams. I think the Hereford bull has the same power of stamping his own merits upon common cattle that the Shorthorn has. I would like to see Shorthorns and Herefords both equally encouraged as a means of improving the common stock of the country. . . . I have seen Herefords in the United States market outsell anything else, by from one-quarter to one-half cent a pound. I should say that in proportion to bone and beef, the Herefords have a little less bone. The worst feature you can find against them is that they are a little heavier in the fore quarter."

Mr. Rawlings, however, makes the rather important admission, "You can't get a Hereford of three years old as heavy as a Shorthorn."

It is probable that Professor Brown pretty nearly hits the mark when he says in his evidence:—

"When we speak of the Hereford, we speak of something that does not on the average equal the Shorthorn in weight or in early maturity, but we do speak of something that will endure hardships better, and thrive better on poor pasture. The Hereford is very considerably ahead of the Shorthorn in regard to its value

for grazing purposes. We may say, therefore, that the Shorthorn is a better stall-feeder than the Hereford, and that the Hereford is a much better grazer than the Shorthorn."

No one can pretend to say that the Herefords are not, in such a country as Canada, a most valuable breed. If it should be found, as it may be that, not in Muskoka alone, but in large tracts of country lying still farther to the northward, there are lands suited for grazing in the summer months but not available for other purposes of agriculture, the value of the Hereford will become even more apparent.

The Devons.

If the Devons were to be judged solely by appearance, their comeliness and beauty would secure them a very high place. They are favourites with all, and have many commendable qualities, some of which are not to be lost sight of in estimating their value to the Canadian farmer.

Mr. George Rudd of Eramosa, and who also farms in the Township of Puslinch, is a breeder and enthusiastic admirer of the Devons. There are two breeds, the North and South Devons—the former rather the larger and finer of the two. It is these Mr. Rudd refers to in his evidence, and probably other witnesses also. Mr. Rudd claims, and his allegations so far will hardly be questioned, that the Devon is a docile, tractable, and at the same time, very active animal. As working oxen the Devons probably take the first place. Mr. Rudd says on that point:—

"As working oxen I consider the Devons superior to all other breeds, as they are very quiet and tractable. . . . The Devons are very sharp cattle and smart on their feet."

Of their quality as breeding cattle Mr. Rudd says:—

"They are very good nurses and do remarkably well with their calves. . . . They are uncommonly good mothers and keep their calves very fat."

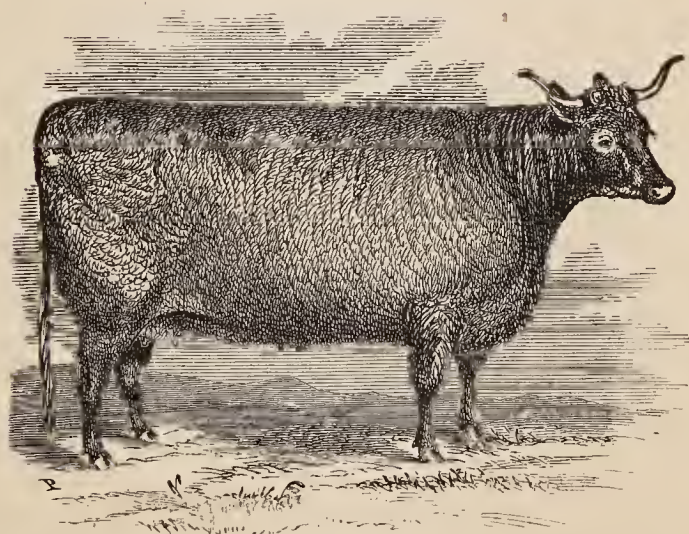
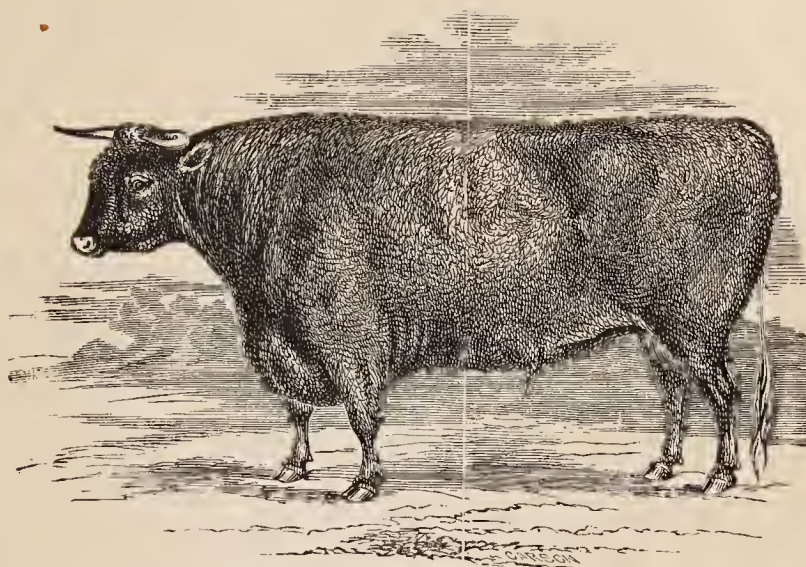
Mr. Rudd as a breeder does not pretend to much experience in feeding for shipment, but says:—

"During the last three years I have had a great many bulls—more than I wanted; and this spring I sold two two-year-old bulls, weighing 3,350 pounds, for \$5.25 a hundred—delivered the same day for shipment. The same day I saw other good steers sold at \$5 a hundred—to be delivered two months later. So the Devons must be considered better for shipment. With the same quantity of feed they seem to take on flesh better than the Durhams. I had a bull at the Centennial at Philadelphia, that weighed between 2,300 and 2,400 pounds; he was nine years old."

He also claims for the Devons that they "produce very nicely mixed beef, and of very fine quality."

As to his comparative trials of the Devons with other breeds, Mr. Rudd says:—

"I kept Durhams before I kept Devons. One winter I thought I would like



DEVONS.

to try the Durhams again, and I sold out all my Devons, and bought a lot of Durhams for which I paid a big price; and after I had kept them for six or eight months I got sick of them—I thought I was nowhere—and before the summer was out I sold them all and bought back the Devons. I considered the Durhams were much harder to keep up and look after, and that they did not pay for the extra trouble and expense. The Devons are a hardier cattle, much more tractable, and more easily managed and taken care of than the Durhams; but the temperament of cattle depends very much on the way they are managed. I have sold more Devons of late than I did."

Major Peters, who has had some experience with the Devons, says:—

"In the past I have bred mostly Devons, but we are not breeding them so much now. I prefer Durham cattle, as there is more demand for them in the market. They are the best breed for improving the common stock of the country, both for dairy purposes and for beef.

"We have raised some splendid steers from Canadian cows crossed with Devon bulls, but they are not so heavy as the Durhams, and I prefer the Shorthorns for breeding good grades. . . . Shorthorns weigh full 300 or 400 lbs. heavier than Devons, but we sometimes get better prices for nice Devon heifers, if they come in about Christmas.

"I think there is a difference between the Devon beef and the Durham beef—much the same as there is between Southdown mutton and Lincoln or Cotswold mutton—I mean that the Devon is shorter grained and nicer. I don't know that I could tell the difference at the table—the difference is not so great that I could tell it from the meat alone. . . . The only quality for which I prefer the Devon cattle to the Durham is the superiority of their meat."

Mr. Morgan, as a shipper, also makes reference to the Devons. He says:—

"The reason I advocate the giving of prizes for Devons is because of the fine quality of their beef. There is about the same difference between Durham and Devon beef that there is between Cotswold and Southdown mutton. It is a hard matter to get a good Devon weighing more than 1,200 or 1,300 pounds. You would have to pay a great deal more freight on them, and you would not get any greater price for them in England.

"If you take a thoroughbred Devon and a thoroughbred Durham and feed them the same until they are three years old you will find 300 pounds more beef on the Durham than on the Devon, and you will get that extra beef carried free to England. If you could get hold of good Devon steers and heifers together I think, perhaps, they would command a little better price.

"I do not think Devons ever will become so popular that we could get shipments of them. They will never become so popular as the Durhams, though they are a nice breed of cattle."

Mr. Courtice, who has some pure Devons, says:—

"I have some pure Devon cattle, but my milch cows are grades of various kinds. The Devon cattle fatten very easily, and make a large amount of beef on small feeding. They are also good butter cows, giving an extra quality of very rich milk. I send the milk to the factory. I have not given much attention to stall feeding. There is a difficulty now in getting pure Devon bulls for crossing. I imported pure-bred Devons at first.

"Devon calves require to be well attended to, so that they get a good start. There is not much demand for Devons now, either in the United States or

Canada. The Devons make a very good cross on large, roomy cows, which have two or three crosses of the Durham in them; but I would not recommend them for crossing on the common stock of the country. I think they give better milk but not so much as Durhams of a good milking family."

The candid admissions of this witness, that he would not recommend the Devons for crossing on the common stock of the country must be the conclusion of everyone who reads the evidence without prejudice. Professor Brown evidently takes that view when he says:—

"The Devon cattle I cannot recommend as equal to the other beefers named unless it be for rich milk in moderate quantities. The Devon is slower for our purpose of raising beef rapidly for the British market. As workers, with strength and endurance, the Devons are first-class animals, and they are found of large value in clearing our back townships."

For quality of milk, firmness of flesh, and liveliness on their feet, the Devons may be duly honoured, but for quantity of milk, size, and shipping qualities, it is idle to pretend they can compete with either the Durham or Hereford, as the breed which is to improve the common stock of the country.

The Galloways.



The Galloways had their special advocate before the Commissioners in the person of Mr. McCrae, of Guelph, who has a fine herd of them, and is warm in his praises of their qualities.

The hardiness of the Galloways is undisputed, and the absence of horns may also, on shipboard, or in railway cars be an advantage. Mr. McCrae, however claims for them other qualities than these. He says:—

"A cross from a Galloway bull and a common native cow, if fed till it is

three years old, will weigh from 1,600 to 1,700 lbs. I have five three-year old Galloway steers at present which I have been offered \$100 apiece for, if fed for six months. I have had Galloways at two years and a-half weighing 1,500 lbs. With regard to their milking qualities, we do not breed them for milking purposes, but the best milking cows we have had of any breeds have been Galloways; still, these are exceptions, and not the rule. We use them for breeding purposes, and let them nurse their own calves, which destroys any cows for milking. I consider the Galloways a good hardy breed to be kept distinct. Their beef is reckoned to be of the very best quality—equal to that of the West Highlander. Some Galloway grades which were taken from the township of Nichol to England were sold for £3 a head more than other beasts—Durham grades—same weight.”

As to their feeding and fattening qualities, he says:—

“In the winter we feed our Galloway cattle on turnips and straw until the month of April, and we find they do well on that. It would cost about one-fourth less to bring a Galloway steer to weigh 1,500 lbs. than a Durham steer; in feeding them together I have found that to be very near the proportion. I do not think I could obtain quite the same flesh on the Galloway at three years old as I could on the Durham; the Durham might weigh from 100 lbs. to 150 lbs. more. The steers for which I was offered \$100 apiece weighed over 1,200 lbs., and were a little over two years and a-half old. A gentleman from England was at my place, and going over the farm and looking at the cattle; for the first one he saw he said, that if I would feed him for six months and make him fat, he would give me \$100; and when he saw the rest he offered me \$100 a head for them if I would feed them for six months. He was from the county of Durham, in England, and he came to this country for the purpose of buying cattle for the English market.”

It is not, however, on hard fare Mr. McCrae brings his Galloways to perfection, for he says:—

“We top off our Galloways by feeding them plenty of good pea-meal and a little bran. This year, I think, we got two or three hundred-weight of oil-cake, and I think we have about one-third of it left. The only way I know of to make shippers aware of the good quality of the Galloway beef is to raise the cattle well, and when they take them home they will become very well aware of it.”

Remarking further that, by careful selection, good milking strains of Galloways can be secured, and on the adaptability of the Galloway to extremes of climate, Mr. McCrae, says:—

“I would recommend the Galloway as being adapted to farmers of the smaller class, with whom feed is an object, and farmers whose land is somewhat rough.”

The reports of the Galloways from farmers who have tried them, however, are not particularly enthusiastic in their behalf.

The opinion of Mr. Stephen White, of Charing Cross, Kent, with reference to the Galloway, has already been quoted in connection with his views respecting the Durham.

Mr. Stedman (Lanark) says of the Galloways: “The Galloways are hardy and good for beefing, but not equal to good Durhams as milkers.”

Mr. Geary, London, says of the breed :—

“I have made no comparative tests of the different breeds for fattening purposes. I have had experience with the Black Galloways on the common or native cattle, but I prefer the Shorthorn. The Galloways don't domesticate as quickly as the others, and are naturally wilder, and the result is that they do not feed so readily. One cross of a Shorthorn bull will make a very good steer.”

Mr. Simmons, Middlesex, has had considerable experience in feeding Galloways, both on grass and distillery feed, and gives the result as follows :—

“I have made comparative tests of different breeds for fattening purposes. A number of years ago I fed stock in a distillery five or six years in succession. I had a large number of cattle of different breeds, among them some pure-bred Galloway bulls, and grade Galloway steers. I found them to be the very worst cattle I had. They did not thrive well at all. They were very cross-tempered, and the more Galloway blood they had in them the worse they were. However, they will do better in the barn or farm-yard than in the stalls of a distillery. I have grazed them, but I found that they did not put on flesh as the Durham cattle did, though they produce a very good cross when the cow is a good Durham grade, but I think the Durhams gain most and are the best cattle. . . .

“I laid myself out to improve my stock by crossing, and anything I have bred I have always bred to a thoroughbred bull. I never tried thoroughbred Galloways on my farm. I have bought steers of that grade in May or June and kept them till the fall, and I have always found that they did not improve so well as the Durham grades.

“These were from Galloway bulls crossed with fair Durham grades. Those in the distillery were very disagreeable to manage, but I believe it was caused by their temper, and I have found that if you cannot get animals quite reconciled to their position, they will not feed well. I do not think their flesh was preferred to that of other breeds. At any time I have had them to market the butchers were always shy of them. If their meat is better than that of others the butchers have not found it out. Black cattle of certain varieties are rather popular with the butchers in England, but from what I can learn, the Galloways are not a class of cattle that command high prices there. I gave the Galloways just the same feed as the Durham grades, but they did not improve so fast. I am now speaking of my feeding in the distillery and grazing. I would not like to give an opinion adverse to that of Mr. McCrae as to the utility of the Galloway as an economical feeder on poor farms in early settlements. We used to have a number of pure-bred Galloways in our district, but they are all disappearing, their disappearance being the result of our experience of their unprofitableness.”

Finally we turn to Mr. Hall's allusion to Galloways in connection with the British demand :—

“The fat Galloway ranks about equal with the Polled Angus ; but a midling Galloway is just about as bad a bullock for a butcher as you can select ; he kills very coarse indeed. The Galloway will bring more per pound than any other breed except the Aberdeen, but he does not cut as streaky as the Polled Angus. If you feed a Galloway bullock and a Shorthorn together, and feed them exactly alike, the beef of the Galloway will eat better than that of the Shorthorn, and it is the same with feeding Leicester sheep and Southdowns together. The Galloways are not the most paying cattle though. Next to the Polled Angus or Scot in point of quality I would put the English Shorthorn.”

Black cattle are, undoubtedly, favourites with the English butchers. And Mr. Hall's authority as to the value of the Galloway well fed and got into prime condition for market is not to be disputed. But Mr. Hall does not take into account the respective maturing qualities of the breeds, nor the probable relative weights of the several classes of cattle. And he must have, too, a prime beast as his standard, for, he says, "a middling Galloway is just about as bad a bullock for a butcher as you can select; he kills very coarse indeed."

The only fair conclusion to be come to from the evidence is that, tried with the Hereford and Durham, the Galloways have not been found profitable; that to make good beef of them they must be as well fed as a Shorthorn, although they might live where a Shorthorn would starve; that they have no special merit as milkers, and that their value would be chiefly, if not altogether, as pioneers of improvement in new settlements where the housing and feeding were both rough, and the means of a settler unequal to the purchase of either a Durham or Hereford bull.

The Polled Angus or Aberdeen Polled.

The Polled Angus cattle being black, and without horns, are frequently confounded with the Galloways, although an entirely distinct breed, as may easily be observed by comparing the two. The Polled Angus are a highly improved breed, long established in Aberdeenshire, on the east coast. The Galloways are from the county bearing their name, on the western seaboard of Scotland. Very little has yet been known of the Polled Angus cattle in Canada, but what has been heard of them has generally been in their favour. A short account of their origin and history may be interesting to some who are unacquainted with either, or with the characteristics of the breed.

From the very earliest times Aberdeenshire, in Scotland, and particularly that part of it called "Buchan," has been famous for its breeds of cattle, the name itself, so it is said, being derived from the fact that it paid tribute to the Romans in oxen, "Buchan" being derived from the Gaelic word "bo," an ox, and "eacn," the head or poll. With the three brothers known as the "stately Williamsons," the largest dealers in cattle of their day, the Aberdeen Polls were, during the last century, special favourites; and later still, they were the chosen breed of Watson, of Keillor. It was, however, chiefly by William McCombie, of Tillyfour, a member of a family whose intense enthusiasm in cattle breeding could be traced back for six or seven generations, that the Aberdeen Polls were so greatly improved and brought prominently into notice. From 1830 to the time of his death, not long since, Mr. McCombie bent all his energies to the task of making his Polled Angus herd famous in the land. His skill as a breeder, and practised judgment, were extraordinary, and enabled him, by careful selection and in-breed-

ing of the most judicious character, to produce a race of animals that were able to send to the great shows representatives that could hold their own against all comers.

The victories won by the Polled Aberdeens in the prize ring would be too numerous to recapitulate here. Suffice it to say it was a Polled Angus bullock that carried off Prince Albert's cup, at Poissy, in 1862, the competition being between all the breeders of the world; that a Polled Angus yearling bull won the gold medal of his class at Paris, in 1878; that a Polled Angus has repeatedly gained the chief prizes at Birmingham, and carried off the champion cup on at least three occasions at the great Christmas cattle show in London, the last of these triumphs being at the show for 1880. The Tillyfour herd now exists no longer. On the 26th of last August it was sold by auction and dispersed. The accompanying plate supplies a very excellent illustration of the Polled Angus breed, of which some very fine animals are to be seen at the Agricultural College and Model Farm at Guelph.

Professor Brown says of these Aberdeen Polled cattle:—

“I am very well acquainted with the Aberdeen Polled, and it is well known that for early maturing it is equal to the Shorthorn, though not, so far as our experience goes, equal to it in improving other breeds or in attaining a greater weight in a certain time. At the present time we may call them our second best beefing breed.”

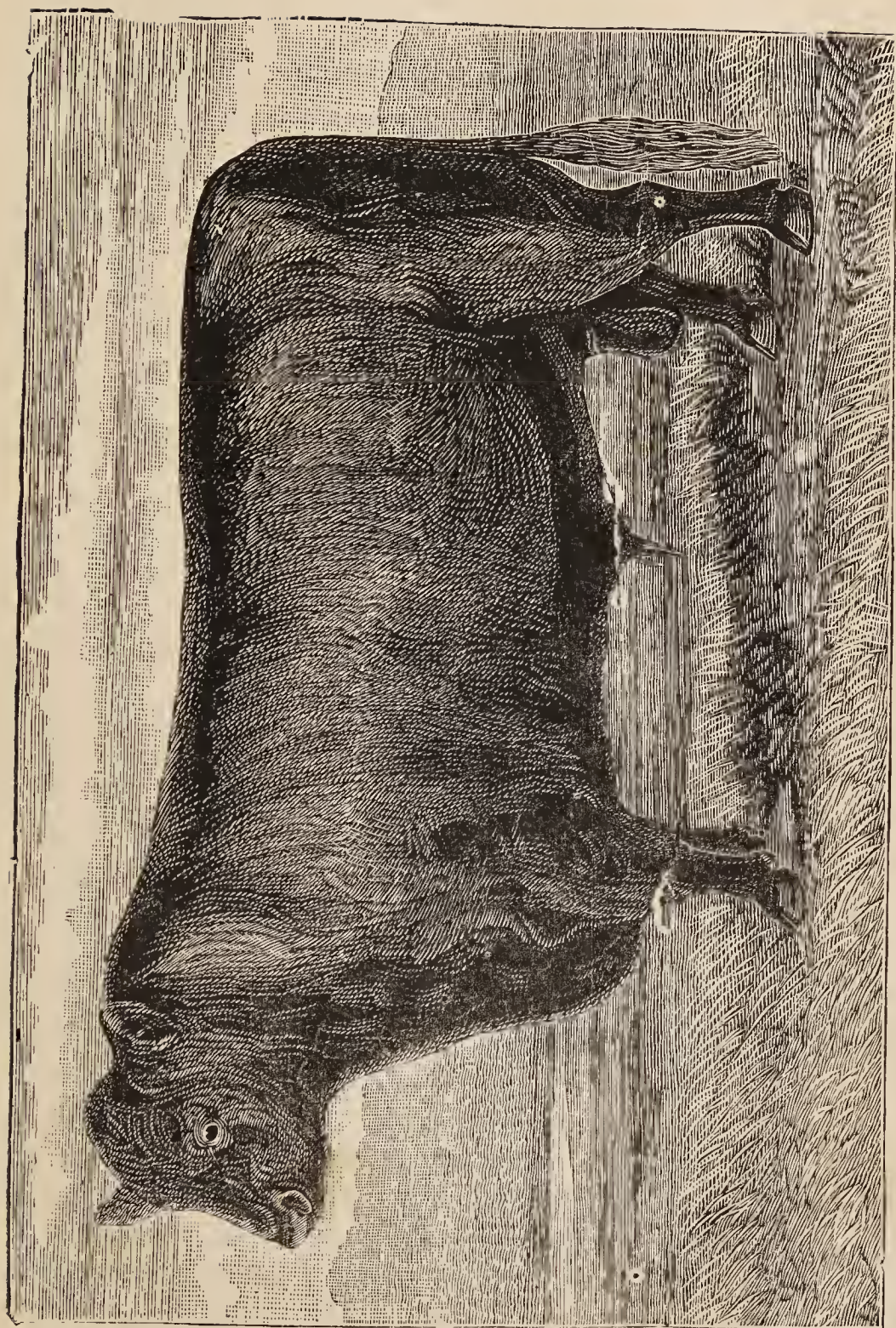
But in the eye of the British buyer of fat cattle Polled Angus does not rank second even to the great Shorthorn. Mr. Hall, in his evidence, says:—

“Of the cattle which come into the English market those which rank highest in point of quality are the Aberdeen Scot. They are the breed known as the Polled Angus. The fat Galloway ranks about equal with the Polled Angus; but a middling Galloway is just about as bad a bullock for a butcher as you can select; he kills very coarse indeed. The Galloway will bring more per pound than any other breed, except the Aberdeen, but he does not cut as streaky as the Polled Angus. . . . Next to the Polled Angus or Scot in point of quality I put the English Shorthorn or Durham.”

Mr. Hall adds, further on:—

“For the purpose of getting good grades I would recommend your farmers to cross your native cattle mainly with Shorthorn and only to cross once. I would also recommend the Polled Angus as an animal for improving your stock; I think the Polled Angus crossed with the Shorthorn would give you an excellent animal for the butchers—that is one cross. I would take a thoroughbred Shorthorn cow and cross her with a Polled Angus bull. I would also cross the Polled Angus with your native cows. I do not think thoroughbred steers sent over to England would fetch any more than other cattle. Whether you would succeed in making anything better than a Shorthorn I would not venture to say, because you have sent some extraordinary cattle into England.”

In the absence of the information to be obtained as in the case of the other breeds from oral testimony, reference has been made to *Wallace's Monthly*, a well



POLLED ANGUS BULL.

known American publication, in which, in the February number for 1879, is a communication from Mr. Thomas Ferguson, a breeder of the Aberdeen Polls for forty years, and residing near Keillor, already mentioned as the farm of Mr. Watson, the owner of the Keillor herd. In regard to the prepotency of the Polled Angus males, Mr. Ferguson says:—

“No bulls imprint upon their progeny their own character and qualities so quickly, and the result of the introduction of a Polled Angus bull among a herd of Shorthorn cows would be a vigorous race of cattle, most of them, if not all of them, black and polled like the sire. I have known a herd of twenty West Highland cows—a breed of cattle with very long and very strong horns—being served with a Polled Angus bull, and every calf was polled, most of them jet black, but a few of a dun colour. In the higher or glen districts of Perthshire, this West Highland, long-horned breed used almost exclusively to prevail, but through the persistent use of Polled bulls the cattle in this district are now almost all black and polled, quite as large in size and of as good quality as the pure Angus.”

Other writers argue very vigorously in favour of crossing the Durham with the Polled Angus, with the object more particularly of abolishing the horns, which it is urged are, in the Shorthorn, (as the popular name implies) a very weak element in the animal's composition, and easily to be disposed of by the prepotency of a Polled male. One of these writers says:—

“The horn of the Shorthorn cattle is less a characteristic and feature of the breed than any other tribe of horned cattle with which I am acquainted. In the females especially, its development is generally unsatisfactory from its uncertainty. It never has a strong, robust growth, and there is no telling what shape it may assume. There is a kind of unhealthy tenderness about it that makes one afraid all the time that some slight contact may knock it off. It seems hardly in accordance with the nature of the animals to develop horns at all, and some of them get little beyond the merest rudiments of horns. Indeed we believe there have been instances where they failed to develop even rudiments. It follows then, that of all the tribes of horned cattle, the horns would be the most easily eliminated from the Shorthorns by the introduction of the Polled blood. The introduction of a bull of the vigorous and prolific stock of the Polled Angus into a herd of Shorthorn cows would be very apt to result in a large majority of the progeny being without horns.”

There is a good deal of resemblance in form between the two herds, as well as in some of their characteristics. Whether there exists any relationship between them or not, is uncertain, but such has been more than hinted at. When a witness before the Commission once irreverently spoke of the Shorthorn as “only a made-up beast,” he was probably stating a simple truth, although the “making-up” has resulted in a creature as nearly perfect as possible. And there is nothing strange, or injurious to either breed in the suggestion that either one may have been at some period used to improve the other. At all events, the similarity is sufficiently close to remove all fear of a too violent cross, if the two be now bred together, or the Polled Angus or Shorthorn bull used on

grades of the other breed. The Polled Angus, as well as the Galloway, retain a fixity of colour unknown to the Shorthorn. The Polled Angus have from time immemorial been black, while the Shorthorn has been everything from pure white to red. Mr. John Miller, alluding to this feature in the Shorthorn's history says:—

“I have tried a cross between an Ayrshire cow and a Shorthorn bull, and have obtained a middling good animal. We know that by continuous breeding of the Shorthorns their colour has changed like the fashions. White was the first fashionable colour, and then roan. The Shorthorns when I knew them first were a different shaped animal from the animal we have now—they were larger and coarser. Red seems now to be the fashionable colour. I think the whites and roans are better milkers than the deep red, better feeders, and better animals altogether.”

The evident merit of the Polled Angus breed, and the absence of general information about them in this country, has induced the Commissioners to notice them rather fully. One or two more extracts referring to points of interest connected with them, may be profitably inserted. One writer says, with reference to crossing the Polled Angus on the Shorthorn:—

“It is probable that the size of the Shorthorn would be somewhat reduced, which might not be a disadvantage, but his quality would not be impaired. Indeed, there can hardly be a doubt that the quality of the meat would be improved. On this point, however, we are not left to reason or conjecture, for the cross has been tried with most happy results. A distinguished Scotch authority says: ‘Of all the varieties of cross-bred cattle, there is none more satisfactory or remunerative than the Polled Angus, or Aberdeen, and the Shorthorn. It grows to a large size, shows great aptitude to fatten, and when killed, the fat and lean are found to be distributed over its carcass in most desirable proportions.’”

The use being made of the Polls to rid the Irish cattle of their horns is referred to by Mr. Ferguson, already mentioned, who says:—

“Although I have all my life been a breeder of cattle, this is more of a feeding than a breeding district. We are largely dependent upon Ireland for our supply of feeding cattle, and although the Society for the Prevention of Cruelty to Animals is doing its best to prevent the ‘barbarous and cruel’ operation of horning cattle, the inhuman practice still to a certain extent prevails. Ireland, however, is now finding it to her interest to use Polled bulls extensively for crossing with her horned breeds, and the necessity for this brutal practice is likely soon to cease.”

Finally, with regard to their milking qualities, Lord Airlie, the owner of a herd of Polled Angus cattle, writes as follows, to the *North British Agriculturist*:—

“I have read with interest the article on ‘Polled Cattle for Shipment Abroad,’ extracted from a New York paper, which appeared in yesterday's *North British Agriculturist*. I should think the Polled Angus well suited to roughing it on the American prairies. As regards their suitability for crossing with the native breeds, the late Mr. Grant tried the experiment in Kansas, and he found the crosses from Polled bulls and American cows arrived on an average at greater weight

than crosses from cows of the same kind and Shorthorn bulls, age and treatment being the same.

"I observe that the writer of the article states that the Polled Angus cows are bad milkers. It is the fashion to say so; and no doubt if you breed exclusively for show-yard purposes, and for beef-producing, you will have a number of very indifferent milkers. The same thing might, however, probably be said of any herd, certainly of the Shorthorns. But if you want dairy cows, and select the right stock, you will not have much to complain of.

"I have at present seventeen Polled Angus milch cows in my dairy. The greater number of these give from twelve to fourteen, and sometimes sixteen Scotch pints for a considerable time after calving. The milk is admitted to be much richer than that of either the Shorthorn or Ayrshire. As regards the length of time for which they will continue to give milk, my cow, Belle of Airlie (1959), (dam of Belus, 749) as pure a Polled animal as any in the Herd Book, used to be milked all the year round. Last year when I was from home they left off milking her about a month before she calved, and she died of milk-fever, induced, as I believe, by the circumstance that she had not been relieved of her superabundant milk.

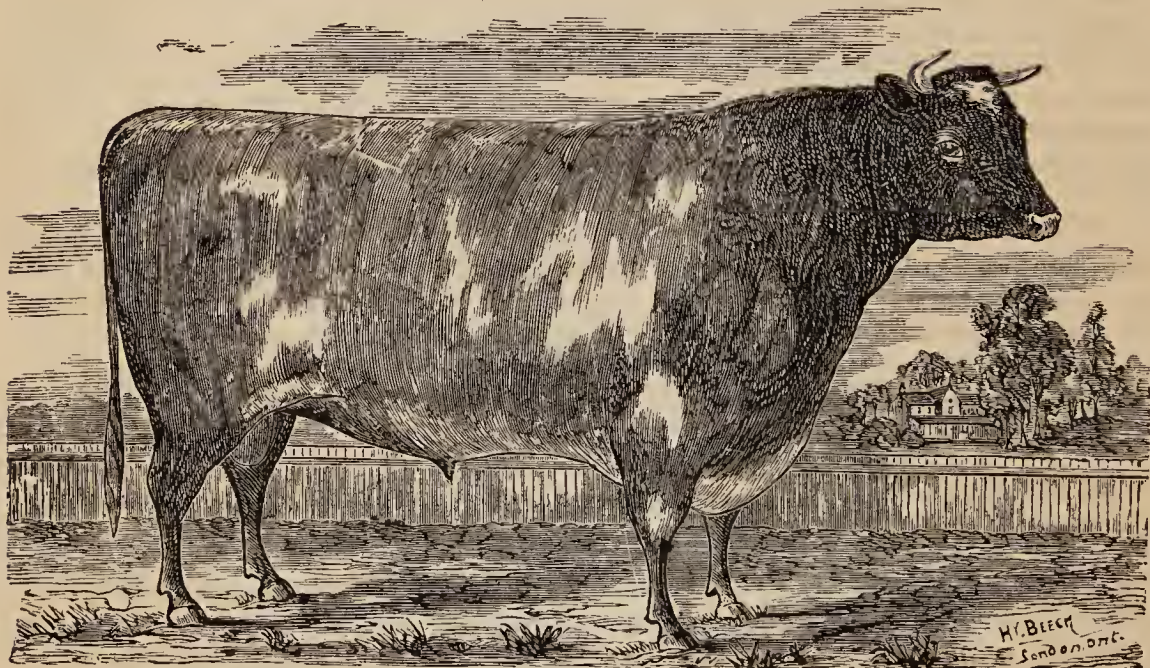
"The cow, Miss McPherson (1252), of the Erica tribe, which I purchased recently of Mr. Adamson, is now giving six Scotch pints per day, more than nine and a-half months after calving. The dairy cows referred to were selected by me with a view to their milking qualities, and whenever I found the produce turn out bad milkers, I drafted and fed them for the butcher, except in a few instances, when from their shapes and blood I thought them likely to produce a valuable tribe of cattle."

It would be very satisfactory to know that a breed so valuable in those respects, which most nearly affect the Canadian farmer's interest, was finding some encouragement in this Province, and that men with the spirit and enterprise that have characterized the breeders of Durhams, Herefords, Devons and Galloways, had been found to afford a fair and full opportunity for a trial of the Polled Angus.

The Ayrshires.

Next to the Durham, the Ayrshire blood is the most numerously represented among the farm cattle of Ontario. The cheese industry sprang into existence just as the termination of the Reciprocity Treaty gave a blow to the trade in cattle with the United States, and milk being thus the first consideration, meat was left for the time rather in the background, for, granting the excellent character of the Ayrshires as milkers, no one pretends to say that, except in a few rare and exceptional cases, they will make any show as beefers. The question that presents itself is, whether their quality in the former case is so remarkable as to counterbalance their short-comings in respect of the latter requirement. And here it may be remarked that, whatever the original and inherent point of excellence in any breed, it is by the skill with which a particular quality has been cultivated and encouraged by careful selection and judicious breeding, that quality is developed to its full extent and capacity. So, on the other hand, even if no single extraordinary merit be inherent in the breed generally, the observation

and shrewdness of the skilful breeder will often discover it in individual animals, and by selection, bring out and establish a strain or family that will permanently retain the characteristic which has first attracted attention. It is clear there are milking families among the Durhams, and, had they ever been sought for, beefing families might have been found among the Ayrshires. It is none the less a fact, however, that the Ayrshires have been bred almost exclusively for milk, and where an Ayrshire bull has been used in this country it has been with an eye to the dairying, not to the feeding and beefing branch of the farmer's operations.



AYRSHIRE BULL.

In his evidence taken by the Commissioners, respecting the Ayrshires, Mr. Jardine, of Saltfleet, one of the leading breeders of Ayrshire cattle, said, "We claim that the Ayrshires excel every other breed of cattle in the quantity of the milk they give, and that their milk contains more caseine for cheese making." He goes on to say:—

"I have crossed them with the native and Shorthorn cattle. In crossing an Ayrshire bull and a thoroughbred Shorthorn cow, we get a fine, large-framed animal, and a good, deep milker—what I would consider a good animal for all purposes. We consider that this cross is an improvement on the Ayrshire for the shambles, and an improvement on the Shorthorn for milking qualities. We have been crossing Ayrshires and Shorthorns in that way for the last five or six years, and our experience has been very profitable. Several breeders of Shorthorns in our neighbourhood cross their cows with our Ayrshire bull.

In regard to the yield of milk, Mr. Jardine says that he considers $2\frac{1}{2}$ gallons a day (ten quarts), the year round, a good average; that individual animals will give three or four gallons, and that one cow gave five gallons for eight or nine

months. That was, however, a very exceptional instance. As to the richness of the milk, Mr. Jardine says :—"The richness I have not tested much." It would have been satisfactory if a gentleman so largely interested in the breeding of Ayrshires could have supplied some accurate information on this very important quality in a dairy cow. Grade steers, Ayrshire and Shorthorn crosses, will, he says, reach a weight of from 1,200 to 1,500 lbs., when three or four years old. He says further :—

"In point of hardiness I think the Ayrshire is equal to the Shorthorn. In point of feeding I think it will live where the Shorthorn will starve; that is my experience of both breeds. The Shorthorn is the more dainty feeder, but it has more capacity than the Ayrshire, and I don't know but that, under the same circumstances it would improve faster. Considering milk and beef together, I would recommend ordinary farmers, for general purposes, to substitute Ayrshires for Shorthorns. I think our native cattle, improved by Shorthorns, would perhaps be better for milk and beef combined than they would be if improved by the Ayrshires, especially for beef. I am aware that some families of Shorthorns give good quantities of milk, and there are some families of Ayrshires that give less milk than others. We do not, as a rule, raise much stock from the poor milkers. We have never had any very poor milkers."

If the matter stopped here it would be rather difficult to appreciate the value of Mr. Jardine's recommendation to the farmers of Ontario to use Ayrshires rather than Shorthorns for improving the native stock. For, first, he has said already that to produce a beefing animal he would call in the Shorthorns to cross the Ayrshire. And he will not assert that the Ayrshire can do for native cattle what it cannot do for itself. So we should not go to the Ayrshire to get grade beefers. Secondly, he admits there are Shorthorns that make good milkers, and if a good milking strain exists in common with a good beefing strain, then the animal that would transmit these two qualities would surely be better than one that could only transmit one of them. Lastly, as Mr. Jardine is reticent with regard to the butter-yielding quality of the Ayrshire milk, it is impossible on his evidence to say the Ayrshire would be the best improver of native stock in point of milk quality as well as quantity.

Mr. James Lawrie, of Malvern, is another well-known breeder of Ayrshires. His evidence does not materially strengthen Mr. Jardine's. Mr. Lawrie went into Ayrshires because the outlay required is less for a herd of Ayrshires than for a herd of Durhams. He says :—"I kept Durhams at one time, but they were very high priced, and if one died the loss was very great." He adds to this :—"I went into the keeping of Ayrshires, because they were easier to keep, and sold well." But he says further on :—

"I chiefly esteem the Ayrshires for their milking qualities. I would not recommend them as superior to others for beef. I certainly think the Durhams are ahead of all others for beef. I have never fed any steers for market, but I have fed several young cows, and have got them to weigh 1,400 lbs. to 1,500 lbs. at three years old. I don't think there is much difference in the cost of feeding

Durhams and Ayrshires, and I don't think buyers would have any preference between the two."

Mr. Lawrie makes butter to the extent of 50 lbs. a week on the average, all the year round, but he, too, is silent as to the yield of butter from the Ayrshire's milk, except in one instance, where he says :—

"I could not give the proportion of milk necessary to produce a certain quantity of butter ; but I sold a cow once to a man in the States, who wrote back to me that the cow had given seventeen pounds of butter a week. He bought her and took her away about the month of June. I cannot tell you the quantity of milk per head that they give each day ; but when in good condition, each cow will fill a patent pail, morning and evening. That, I suppose, would be twenty-four quarts per day, but that does not last all the year round."

The yield of milk mentioned would, if distributed over the year, probably be nearly the same as Mr. Jardine's. And if the purchaser of the cow mentioned by Mr. Lawrie kept strictly within the facts, it would still be hardly safe to predicate a twelve months' yield from a whole herd on that one animal's performances.

Another breeder of Ayrshires is Mr. Yuill, of Almonte. He pays special attention to dairying, manufacturing from 1,400 to 1,500 lbs. of butter annually, besides the butter required for family use. His testimony is very strongly in favour of the Ayrshires for dairy purposes. He says :—

"I devote my attention largely to thoroughbred stock of the Ayrshire breed. I have been breeding them for twelve years. I have bred no others. For dairy cattle I prefer them to all others. If the Ayrshire does not bring as much for beef, it costs less in proportion to feed them than the Durham.

"If going into cattle feeding for market, I would prefer the Galloways or Polled Angus. They are thriftier animals for our bare pastures in summer, and hardier in winter. If they have to look for their feed themselves they will do best, but for feeding altogether in stalls I would consider nothing better than the Durham. I used a Galloway bull one summer, but was persuaded he would not suit, and so sold him. Stock got by him were poor dairy cattle, but grew a great size. I then went into Ayrshires, and have about thirty, as well as a few well-bred grades. They vary as milkers.

"I should say that, as against the native stock, the Ayrshires would be better for milk by one-third. The skim milk is very good for raising calves."

Perhaps, however, it is when we come to examine the evidence of farmers who are neither breeders of Ayrshires nor engaged exclusively in dairying that the most useful information for persons carrying on mixed farming will be found.

Mr. Miller says on this point :—

"I have had very good milking Ayrshires, but I have known some of the best families of Durhams to give more milk than they would. I think it is best, in breeding cattle, to endeavour to combine the two qualities of milk and beef. I have known grade cattle to be very good milkers—crosses of Shorthorn bulls and Canadian cattle are just as good as the Ayrshires for milking purposes."

Mr. Benson says :—

"I have kept distinct herds of Ayrshires and Shorthorns, and I have crossed

the bulls of both breeds on the common stock, and I like the cross from the Shorthorn very much the better, even for milking purposes. . . . I have had a great many cows passing through my hands, and I have never bred a common cow to a Shorthorn bull unless it was an extra cow; in that way I have only crossed the pick of the native cows, some with Shorthorns and some with Ayrshires. I never found the cross from the Ayrshire to milk better than the cross from the Shorthorn, and with the Shorthorn cross you have the additional advantage of having a large animal which, apart from its milking properties, you can fatten for beef. The milking quality of a cow is a little arbitrary. I have sometimes expected good results from breeding cows from an Ayrshire bull, and have not had my expectations realized. Taking meat and milk together, I think the Shorthorn cross is the best. The milk coming from the Shorthorn is, I think, more suitable for general purposes than the milk from the Ayrshire. The Ayrshire is a capital cow for cheese, as the Jersey is for butter, but I think the Shorthorn combines a little of both qualities."

Mr. Matheson, of Perth, having explained that he had first purchased an Ayrshire bull and replaced it with a Durham, says:—

"The reason I used an Ayrshire bull was that I wanted to get a good grade animal for dairy purposes; but I found out that the animals produced were very small, and I thought the milk was deficient. I thought some of my good common cows were better for dairy purposes than the Ayrshires; but I wanted to get an animal that would be good for dairy purposes, and that could also be fattened for beef, if anything occurred to destroy the milk properties of the cow. The Shorthorn cross has turned out very well, and I am only sorry that I did not begin in the first place with the Shorthorn. . . . Four years ago there were only four pure-bred bulls in our district; they were all Ayrshires, but they have all been replaced with Durhams."

In the township of Gosfield (Essex) the experience related is a little different from Mr. Matheson's, for Mr. McCain says:—

"The Shorthorn is a good deal raised in our township, but the people are beginning to think that they can improve them by getting other breeds, and they are now inclined to the Ayrshire. We do not raise cattle for beef to any extent; I don't know whether the cross would improve the calves, but that does not make much odds, as we calculate upon getting \$1 per week, on the average, for the calves. The Durhams are very tender and require a great deal of care, and if they don't get this care they don't amount to much. The Ayrshires are very hardy. We are crossing the grade Durhams with the Ayrshires, but we have not had any experience of the result yet. Last year I raised a bull calf from a cow which was half Durham, and a thoroughbred Ayrshire bull, and it was the best I ever raised. I am going to use it for breeding purposes. The Ayrshires are a hardier breed than the Durhams, in the way we raise our cattle."

In his district, it will be noticed, Mr. McCain says they do not raise cattle for beef to any extent, and probably look most to milking qualities. The concluding remark, too, suggests that hardiness in that section is a virtue not without its special value.

Mr. Robert Macfarlane, resident not far from Mr. Yuill, in Lanark, gives evidence directly the reverse in its nature to Mr. McCain's. He says (and as a dairyman and large milk vendor, his testimony is valuable):—

"I keep an average of 12 cows in milk, and about 20 head of cattle altogether. They are improved stock. Originally the Ayrshire was used to improve them, and more recently the Durham. The Ayrshires were too small. I count to get an average of eight quarts a day for ten months from each cow. We sell the milk chiefly and make butter of the rest. I reckon to make \$60 annually per cow and could do more if we could sell all the milk. . . . We consider the Durham cross equally as good for milk as the Ayrshires, and get the benefit in the carcass also."

Professor Brown, who will not be suspected of prejudice in favour of common stock as against well-bred animals of any breed, refers to the Ayrshire as follows:—

"With regard to cattle for milking purposes, looking to the experience I have had during the last ten years, I would say, that, if I were to select an animal for its milking properties alone, I would have no hesitation in making choice among the better animals of what are called Canadian cows, as against any Ayrshire or Jersey I have ever seen, for our Province. But, if I were looking for another line of profit along with milking properties, I would have no hesitation whatever in choosing a Shorthorn grade.

"It is very difficult indeed to say positively what the Canadian cow is. I presume it is something that is not native, but has been brought to this country from the United States, probably fifty or sixty years ago and later, and has become mixed with Shorthorn blood, and then wandering in the bush, they largely lost their beef properties, but still retained their milking properties, which are not so much impaired by in-breeding. So that I do not know what to call the Canadian cow exactly, though I fancy it is one-fifth or one-sixth Shorthorn, with a spark of Devon and Ayrshire here and there.

"When I speak of the native cow's milking properties, I do not refer to quantity alone, but also to quality. There is no doubt that the Ayrshire is first with regard to quantity, although she will not endure the same pasture as the Canadian cow; but looking at all sides of the question, I am convinced from my own experience that a proper choice of the Canadian cow is ahead of the Ayrshire for our Province."

Referring to the evidence specially relating to the dairying interest in its several branches, it is a noticeable fact that only one witness directly recommends the use of the Ayrshire, although several do advise recourse being had to the Durham. One or two witnesses, however, allude to the general improvement of their dairy cows by the mixture of Ayrshire or Durham blood. Mr. Inglis, on the other hand, who speaks from an intimate knowledge of the butter trade, says:—

"The Ayrshire bull would be good; but I believe the Shorthorn would be the best. By selecting the best females, and killing off the others, I believe we could in a short time obtain a good grade for milking, and also work a permanent improvement in all our stock. I believe the milk from a good Shorthorn grade would be satisfactory both in quality and quantity for butter making."

Mr. Macpherson, of Lancaster (Glengarry), looks at the matter from a cheese manufacturer's point of view. He says:—

"The Durham bull, however, is coming into more general use. There have been Ayrshires for a few years back, but latterly the favourite breed is the Dur-

hain. It is now quite common for our farmers to raise their best heifer calves to supply the waste of their herds."

But Mr. Ballantyne, who speaks from very extended observation among the western dairymen, says:—

"I agree on the whole with what has been said as to the best kind of cows for dairy purposes. Grade Durhams will answer the purpose, but so far as my observation goes there are comparatively few nearly thoroughbred Durhams that are good milkers. I have seen good stock raised by crossing grade cows with Ayrshire bulls. I once bought two Ayrshire bulls for that purpose, and they produced the finest milkers I have seen. The grades in that case were crosses between a Durham and the native cows. It is possible that the original native cows are Ayrshire to some extent. They partake of the Ayrshire character to some extent. I think that perhaps a cross between our native cows and Ayrshire bulls would be the best milkers."

Mr. Francis Malcolm, again, who is a dairy farmer on a pretty large scale, gives his reasons very emphatically for preferring the Durham. He says:—

"What is wanted, is a *short-legged, straight, smooth, heavy bodied cow*, and also a *good milker*. I do not say that cows of another stamp may not be just as good for milk, and perhaps better, but there is a reason why I would prefer and recommend this kind of cattle. Almost every year some have to be weeded from the herd on account of some defect, or it may be desired, to some extent, to breed and raise beef cattle for the English market. In either case, with such cattle, feeding may be done with a prospect of profit. Another reason why I prefer the Durham is, because the general farmer is under the necessity of making the common cattle of the country the basis to work upon, and I think it is generally conceded that no breed surpasses the Durham in its ability to improve the stock. Among those common cattle are found the best of milkers, and by crossing such with a thoroughbred Durham bull, also selected from a good milking family, a dairy cow may be obtained of the stamp above mentioned. If not at the first crossing the process should be continued.

"Another reason for preferring the Durham is, because it is the most widely spread in the Province, and therefore, the most easily obtained. It is also the opinion of many practical dairymen in the United States that no breed surpasses the grade Durham for milk. In regard to their beefing qualities I might mention that, last spring, I sold two that had been milked for a number of years for \$128, or 5 cents per pound live weight."

To those who may from their well-established milking qualities be disposed to adopt the Ayrshires, a word of caution on one point from Mr. Jardine may be useful. He says:—

"The milk fever gives us a great deal of trouble. In any time we have not lost a beast from any other cause, except one bull. The fever has always come on after calving, with one exception; that was a cow which took sick a few hours before she calved, and showed symptoms of milk fever. The disease is considered to be incurable. We have one cow which lost the use of one leg from the fever, but she is still breeding; we had another that recovered for a time, but went off on the third day. There are two kinds of milk fever. One is a sort of inflammation of the womb—a parturition fever; another is inflammation owing to the rapid change from blood to milk. I have gone so far as to give them medicine before calving, and they still had the milk fever. Any that we have lost we have

milked before calving. I think a dose of stimulants after calving is a good thing. None but good milkers take milk fever."

The disease is no doubt induced by the constitutional change that takes place at the period mentioned. It may probably be more amenable to preventive treatment than to curative remedies. And however annoying now and then to lose a very good cow, it is something to know "none but good milkers take milk fever."

Points in an Ayrshire.

To purchasers of Ayrshires, too, a description of the "points" of the animal as given by so good a judge, cannot fail to be interesting. Mr. Jardine says:—

"In buying an Ayrshire cow, I judge of it by beginning at the head and going back to the tail.

"I look for a fine muzzle, a very prominent eye, wide between the eyes, a long slender horn, a slim neck, a slim, flat shoulder, a good wide chest, but not deep, narrow shoulders, an increasing width backwards, a full flank, wide across the loins and hips, a square, roomy vessel, with the teats set well apart, and a teat to each quarter of the vessel, and a small fine tail, tapering down to the point.

"I place a good deal of importance on the esutcheon, which ought to be wide and run up to the pelvis.

"I do not think the colour of the skin has any effect on the quantity of milk, but for richness we look for a deep yellow skin. We have two or three cows which are very marked in that way, and consider their milk is a little richer in quality than that of others.

"I never like a short tail; I think it is an indication of coarseness. I cannot say that there is anything in the colour of the hair of the different breeds.

"We have our fancy colours. I do not like a light colour; I do not think light coloured animals do well in this country, as I think a light colour indicates delicacy, and greater liability to vermin. I like dark-coloured Ayrshires, with dark noses, which I think are hardier. The lighter coloured animals do not seem to stand the heat of the summer or the cold of winter so well as dark ones.

"I do not think a long face is necessary to a good milker, although we find some very good milkers with long faces from the eye to the muzzle.

"I do not like a crumpled horn; we think it is a defect to the eye, and that it is not so fine a point in the Ayrshire as a long, slender horn.

"The less loose skin there is on the brisket the better; I do not like any coarseness or any extra skin there at all, although this perhaps may be a fancy. But I think it indicates that the animal is flabby and weak in its constitution."

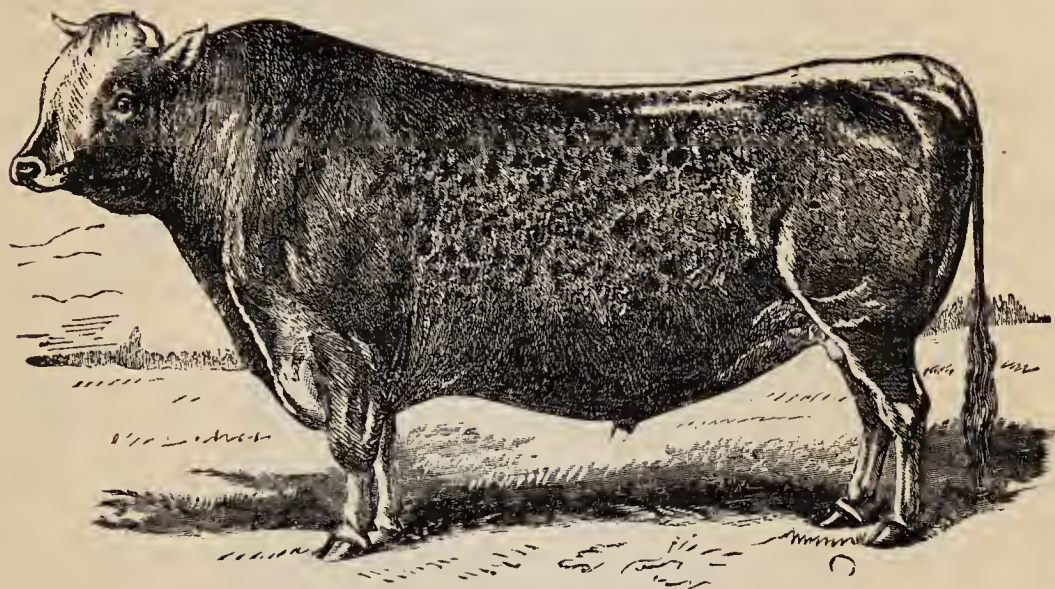
Mr. Lawrie, on the same subject, says:—

"I have been at several Ayrshire shows. I found that the ideas in choosing Ayrshires had greatly changed when I last went home. When I was younger, we selected an Ayrshire with a fine long muzzle and a long horn; but I found when I went back that they wanted a shorter face and a shorter horn, which, they said, indicated a stronger constitution. They also wanted an animal well wedged in the flesh and getting wider backwards, with the bag well up, and the milk veins shown very prominently. They have the fashion of saying that when the bag gets low it indicates that the cow has lost her grip. I think an Ayrshire ought to show a good escutcheon. I like a yellow skin. The favourite colour in

Scotland is mottled red and white; but I don't think there is anything in the colour more than that it shows breeding from good stock. *I do not agree with Mr. Jardine in favouring black noses. I detest them, and they would not be tolerated in my part of the country. I have not one black nose in my whole herd.*"

The Commissioners might be suspected of a pun if they alluded to the great nose controversy as the point of disagreement between Messrs. Jardine & Lawrie. They do not feel called upon to pronounce judgment in a matter so momentous. And as many a wrangle as to the value of colour in a horse, has been concluded by the sententious observation, that a good horse cannot be a bad colour, so they will terminate the reference to this difficult question by remarking that a good Ayrshire cow cannot have a bad nose.

The Jerseys.



JERSEY BULL.

Mr. Clarke, of Brampton, was the only witness examined who represented the Jersey breed of cattle. Mr. Clarke does not pretend that the Jersey is of special value for anything but yielding a liberal supply of milk, capable of producing rich butter. From six cows he has, he says, without extraordinary feeding, got 1,800 lbs. of superior butter in a year. He does not claim that his bulls are particularly impressive or prepotent, for he says:—

"The Jerseys in some cases rapidly convey their milking properties to the common animals of the country—not in all cases; some of the bulls leave their impress much more than others."

He has crossed them with the Durham with fair results, and says:—

"The result of crossing a Jersey bull on a Shorthorn cow was, that I got good milkers of a fair size. The milk was very rich; the cross seemed to partake of the Jersey with regard to its milking qualities, and seemed to have more of the

Durham build about it. In that case the male did not impress himself so much on the make of the animal as on its milk."

For family use, or where the sole object is to command a high price for very choice butter, the Jerseys are a useful breed of very docile and manageable little animals, but to the ordinary farmer they are, and are likely to remain, practically unknown.

The Holsteins.

Although it is quite possible that traces of Holstein blood are to be found here and there among the bovine descendants of some old Dutch importations, the Holstein cattle are not, so far as any information before the Commissioners goes, represented by a single beast in Ontario to-day. This is the more singular, because in the United States they have been bred for several years as well as imported largely from Holland. The Holsteins were alluded to incidentally by one or two witnesses. Mr. Ballantyne, in the course of his evidence, said:—

"My attention has lately been called to the Holstein cattle, through a gentleman who owns a herd of that breed in New Jersey; they are bred and kept chiefly in Holland, where the greatest attention is paid to the development of the cow's milk-producing qualities, as the small farms would not permit the keeping of inferior cows. The cows I refer to were owned by a nephew of Gov. Seymour, of New York.

"One of them yielded, after her first calf, 8,900 lbs. of milk during the season—of probably not more than 300 days. These cows were shown at the International Dairy Fair at New York last December. The other cow, for 12 days, gave 118 $\frac{3}{4}$ lbs. per day—or for the season 12,600 lbs. I have no doubt, from what I have read and heard, that we have no cow equal to the Holstein for dairy purposes.

"They are a distinct breed with marked characteristics, spotted black and white. They have a larger frame than the Ayrshires, and are not so handsome as the Durhams, but are of fair size. They are horned cattle. The owner imported these cows himself. He was in Holland on a trip, and he told me that he took great precautions in selecting them, so that probably they were extra good animals. He mentioned the price he paid, but I forget it. It was not excessive, however."

The information thus obtained was sufficiently interesting to induce further inquiry, and a correspondence was opened with some of the breeders of Holsteins in the United States. These gentlemen, with great readiness, responded and furnished a very considerable amount of documentary evidence, which will be found in Appendix H. The several excellent illustrations of Holsteins have also been obtained from the same sources. The Holsteins are introduced in the evidence above mentioned by a communication from Mr. Wing B. Smith, of Onondaga Co., N.Y., to the *Rural New Yorker*, as follows:—

"Grazing upon the meadows of Holland can be seen great numbers of cattle, large, finely formed, wonderfully symmetrical, fully developed, uniform in colour



HOLSTEIN BULL, "UNCLE TOM"—OWNED BY SMITHS AND POWELL, SYRACUSE, N.Y.

and general appearance, with a remarkable development of the milk-producing organs, whose yield at the pail fully realizes the promises of their development.

“Some of the choicest of these animals have been imported into this country, and they, with their descendants, constitute the Holstein breed of cattle of the United States. It must be borne in mind, therefore, that the Holsteins are not an experiment either in Holland or in this country, having been known here since 1852. No other breed known to us can so directly trace their lineage back for so many centuries. . . .

“Holsteins have now been introduced into many of our States, and without reference to climate, soil or location, they thrive as well and furnish equal records of milk in Virginia, Massachusetts, Vermont, New York, Illinois or California. Be it on the highlands or lowlands, in the cold climes or warm, under all circumstances, with all kinds of food and divers manners of supplying it—under all these conditions they still maintain that same superiority as milkers and beef animals with which they have been here accredited. They are remarkably vigorous, and are seemingly little given to disease; and, standing beside the popular breeds of this country, they are far less affected by the extremes of our variable climate than others, while they bear exposure far better than most other breeds.”

The name of Governor Seymour is one universally known and respected in New York State. In answer to a letter addressed to that gentleman on behalf of the Commisioners, the following reply was received:—

“Governor Seymour requests me, in reply to your letter of inquiry, dated the 24th instant, to say that he is too ill to write except by the hand of another. He says the Holstein cattle are thought well of by our farmers. They grow to a large size, and are free milkers, and while the milk is not so rich as that of some other breeds, yet it is rich enough for cheese. They are gentle cattle and best adapted to smooth and rich pasture, and make good beef. Mr. Gerrit S. Miller and Mr. Dudley Miller, of Peterboro', in Madison County, have imported and kept first-class specimens of this breed, and so does Mr. James Neilson, of New Brunswick, New Jersey, and there is a fine herd within four miles of Utica.

(Signed)

“JOHN J. SEYMOUR.”

Mr. Gerrit S. Miller, of Peterboro', Madison County, N.Y., alluded to in the above letter, writes as follows:—

“At the request of Mr. Singerly, of Philadelphia, I will cheerfully give you whatever information you may wish regarding Holstein cattle. I mail you a copy of Holstein Herd Book, Vol. 3; in it you will find a short sketch of the history of the breed, and a few other interesting items. The great advantage the Holstein has over other breeds is in its *combination of valuable qualities*. 1st, it is the *greatest* and most *economical* milk producer; 2nd, the milk is better adapted to general use, such as the milkman, family, cheese factory, and at the same time makes excellent butter (some of the smaller breeds will make a pound of butter from less milk than the Holstein, but their milk is not so desirable for other purposes); 3rd, they are of large size, fatten quickly, and make excellent beef; 4th, they seem to thrive in hot, cold, and damp climates, and are possessed of hardy constitutions. I have been breeding these cattle since October '69, when my first importation came from Holland, and am more than ever satisfied that they are the best breed for general use.

(Signed)

“GERRIT S. MILLER.”

It will be observed that the enterprising importers and breeders in the States have already their Holstein Herd Book, in order that the purity of the breed may be effectually guaranteed and protected. Mr. Singerly, of the Philadelphia *Record*—four of whose cattle are represented in one of the accompanying plates—writes as follows:—

“I have had nearly two years’ trial of the Holsteins. I have some forty, old and young, and I think they are beyond question the best breed of cattle, for the farmer, known. Cows give from 50 to 60 pounds of milk per day, and milk close up to calving. I send you photos. You will notice one named ‘Dairymaid.’ She is due to calve in fifteen days, and is now giving 24 pounds of milk a day. Heifers, that come in at twenty-four and twenty-six months old, are giving 40 to 46 pounds per day. The records of some half-breds show almost as well.

(Signed)

“WM. SINGERLY.”

The largest herd alluded to in correspondence on this subject, is that of Messrs. Smiths & Powell, of Syracuse, N.Y. To their herd belongs “Uncle Tom,” the subject of the first illustration of Holsteins. From the milk record of some twenty cows furnished by this firm, the following are selected:—

“Milk records of thoroughbred Holstein cows of the herd of Smiths & Powell, for one day, and for one to six months, according to time in milk, to date, August 24th:—

“Neilson, 7 years old, $74\frac{3}{4}$ lbs. in 1 day; $2,206\frac{6}{16}$ lbs. in 1 month; $9,805\frac{5}{16}$ lbs. in 6 months; $11,744\frac{1}{4}$ lbs. in $8\frac{1}{2}$ months. Jannek, 7 years old, $71\frac{3}{4}$ lbs. in 1 day; $2,110\frac{1}{4}$ lbs. in 1 month; 9,250 lbs. in 6 months; $11,644\frac{3}{16}$ lbs. in $8\frac{1}{2}$ months. Ægis, 6 years old, $82\frac{3}{4}$ lbs. in one day; $2,289\frac{9}{16}$ lbs. in 1 month; $10,904\frac{5}{16}$ lbs. in 6 months; 14,402 lbs. in 9 months. Aggie, 6 years old, $84\frac{3}{4}$ lbs. in 1 day; $2,362\frac{1}{9}$ lbs. in one month; $9,563\frac{2}{16}$ lbs. in 5 months; $13,540\frac{1}{4}$ lbs. in 8 months. P. of Beemster, 4 years old, $55\frac{1}{4}$ lbs. in 1 day; 1,537 lbs. in 1 month; $6,799\frac{1}{8}$ lbs. in 5 months; $10,113\frac{11}{16}$ lbs. in 8 months. Sappho, 3 years old, 64 lbs. in 1 day; $1,755\frac{5}{16}$ lbs. in 1 month; $5,562\frac{7}{8}$ lbs. in 4 months; sold. Lady of the Lake, 2 years old, $45\frac{13}{16}$ lbs. in 1 day; $1,344\frac{11}{16}$ lbs. in 1 month; $7,056\frac{3}{4}$ lbs. in 6 months; $9,891\frac{1}{8}$ lbs. in 9 months. Matron, 2 years old, $44\frac{7}{8}$ lbs. in 1 day; $1,243\frac{7}{16}$ lbs. in 1 month; $5,641\frac{7}{8}$ lbs. in 5 months; $8,226\frac{15}{16}$ lbs. in 8 months. Harvest Queen, 2 years old, 44 lbs. in 1 day; $1,249\frac{11}{16}$ lbs. in 1 month; $4,952\frac{6}{16}$ lbs. in 5 months; $6,850\frac{3}{4}$ lbs. in $7\frac{1}{2}$ months.

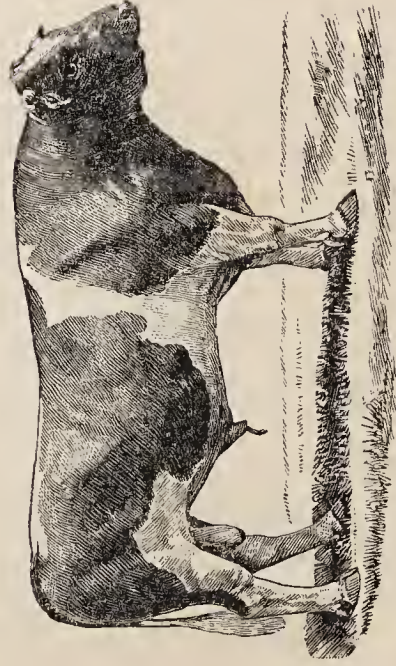
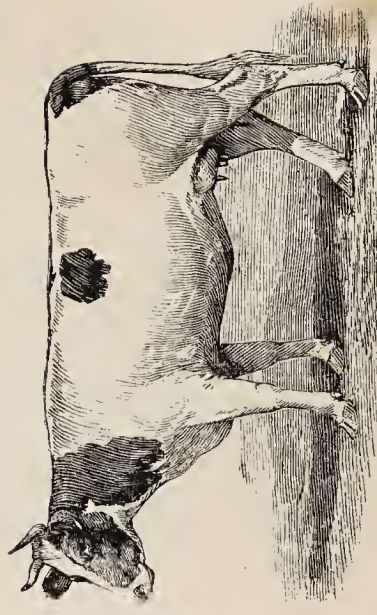
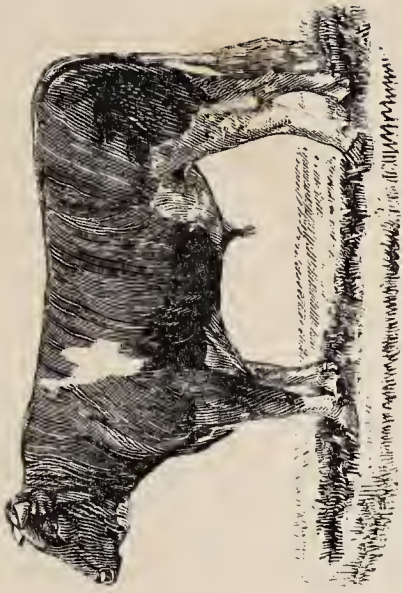
“Netherland Queen made a two-year old record in 1879 of 58 lbs. 12 oz. in one day; 1,670 lbs. 9 oz. in one month, and 13,574 lbs. 3 oz. in one year. Maid of Purmer in 1879 made a two-year old record of 10,893 lbs. 1 oz. in one year.”

Messrs. Smiths & Powell, after giving the foregoing figures, go on to say:—

“We have made a careful study of the breed, its origin, growth, native country, its prominent characteristics, etc., and after several trips through Holland, visiting many farms where these cattle are, importing, breeding, and observing the effect of change of location, we have decided in our own minds that they are the *coming* breed for milk, or milk and beef combined. Our herd now numbers about 150 head, and our record proves their superior merit.”

The question of size or weight of the Holsteins remains to be noticed, as well as any evidence touching the quality of their milk. On the latter point Mr. Wing B. Smith says:—

“As to quality of the milk, we believe it is universally conceded that the



HOLSTEIN CATTLE, OWNED BY W. SINGERLY, PHILADELPHIA.

butter and cheese of Holland are rarely excelled, and to the breeder or dairyman, another vital point is the quantity of butter given. Records prove more than mere statements. Maid of Twisk gave 14,312 pounds of milk in a year; actual experience proves that $20\frac{1}{4}$ pounds of milk made 1 pound of butter, which gives $706\frac{3}{4}$ pounds of butter in one year.

"Snow Flake, two and a half years old, gave 10 pounds a week. Texelaar produced 17 pounds 14 ounces of butter from cream of six days' milking. Texelaar 9th produced $12\frac{3}{4}$ pounds per week, and her daughter 14 pounds of butter in a week.

"Sixty-eight pounds of milk taken from two cows (Maid and Jacoba) were set aside, the cream taken off when the milk was sour, and churned by itself in a common 'dasher' churn, with the following result: $3\frac{1}{2}$ pounds of butter to 68 pounds of milk, or 1 pound of butter to 19 $\frac{3}{7}$ pounds of milk; butter was weighed before salting, and milk thoroughly washed from the same. From the daily milkings of Eva 3 pounds of butter were made for long periods. To prove the importance of Holland as a dairy country, let me state that one small province of that country exports nearly 5,000,000 pounds of butter annually to the markets of continental Europe and the British Isles. Holland exports annually 32,000,000 pounds of butter and 61,000,000 pounds of cheese, which, for so small a country, is truly remarkable."

The excellence of Dutch butter, and its importance as an exported product of Holland is well known, although it will be noticed in some of the foregoing evidence, that, while the enormous yield of milk is conceded, the richness of the milk is not so prominently claimed. The writer last quoted says with regard to weight:—

"I have claimed for this breed of cattle a place among the beef animals, and would sustain my position by offering the following actual weights:—

Bull,	4th Highland Chief.....	2,700 lbs.
"	Uncle Tom, at 26 months	1,525 "
"	Chieftain, 21 months	1,425 "
"	Calf, Pedro, 8 months	550 "
Cow,	Virginia, 6 years	1,695 "
"	Lady Texal, 6 years	1,780 "
"	Isis, 4 years	1,510 "
Heifer,	Mabel, 3 years 10 months	1,400 "
"	Meika, 21 months.....	1,010 "
Calf,	Anna, 11 months ...	770 "
"	Sappho, 10 $\frac{1}{2}$ months.....	700 "

The above cows were all in milk at time of weighing, and not in extra flesh, and had they not been in milk at the time of weighing, they would have weighed very much more. I could extend this list indefinitely, but space does not permit."

Experiments made under scientific authority are also referred to, and satisfactory results are claimed in comparative tests between the Holsteins and other breeds. The Commissioners, however, in the absence of an opportunity for taking oral testimony and subjecting all statements to critical *viva voce* examination, desire only to submit so much as may justify or show the propriety of further inquiry made under proper authority and by competent experts. The

importation of one or two herds of Holsteins, and the observations such a step would admit of, would be eminently satisfactory, if either the Government through the Agricultural College, or some of the many public-spirited agriculturists and breeders of the Province, were to take the matter in hand.

In Professor Brown's evidence will be found given in detail, and illustrated by a diagram, an account of a series of experiments, over four thousand in number, conducted at the Model Farm for the express purpose of determining the milk and butter producing qualities of several breeds of cattle. For reasons stated, these experiments, as regarded some of the animals selected for test, were interrupted, and, careful and elaborate as the investigation had been up to the point at which Mr. Brown's evidence was taken, it was not then, it was fully understood, so complete as to warrant the publication of authoritative deductions therefrom. While, therefore, the experiments will be found, as they appear in the evidence, very interesting and suggestive, it would not be proper for the Commissioners to refer to them as affecting their opinion regarding the merits of any of the breeds under discussion.

Conclusions.

The duty of deciding which of the breeds an impartial authority should advise the Ontario farmer to have recourse to, as a means of improving his stock generally, does not appear to the Commissioners to be a very difficult one. They desire, however, to guard against the impression being created, that they would discourage the cultivation of any one of the several breeds mentioned in the foregoing evidence. Each one has useful characteristics, and may find its place in the agricultural economy of the country. Some persons go so far as to suggest that the prizes given at shows should be discontinued to all but one or, at most two, favoured varieties. The Commissioners are not prepared to advise such a step. The day may not be distant when the whole question of prizes will have to be discussed, and, in that case, many modifications of the present system may have to be adopted. Meantime the Commissioners are of opinion that great consideration should be shown to those enterprising and spirited persons who, at a very large outlay of capital and with not too much encouragement, have devoted their attention to the less popular and consequently—in a general sense—less profitable breeds.

The opinion has already been expressed that full information, tested by actual experience, as to the merits of the Polled Angus and Holstein breeds respectively would be most desirable.

The evidence obtained as to the qualities of the Polled Angus, more particularly as beefing cattle, the proofs of the success they have achieved in the prize ring, and the estimation in which they are held by the British salesman and butcher, give them the strongest claims to attention by Ontario breeders.

The statements as to the size, weight and early maturing, as well as extraordinary milking qualities said to belong to the Holsteins, commend them also to closer observation and strict scrutiny.

Coming to breeds more familiar to the farmers of this Province, it is clear to everyone that, for general use, and for a combination of beefing and milking qualities, the Jerseys are not to be thought of. They must be regarded as useful for their own particular and specific purpose of yielding a copious supply of very rich milk, and as suited exclusively to butter dairying purposes, or for private family use.

The Ayrshires have a far closer relationship to the common cattle or natives than the Jerseys—possibly than any other breed, although that is an open question—and Ayrshire bulls may be found of service in maintaining and perpetuating or reviving the milking functions where they appear to have fallen off, or to be declining. The Ayrshires can be brought to a fair size for market, and—some tendency to milk fever excepted, owing to the great activity of their milking functions—are a hardy and thrifty race of cattle. But it is impossible to say that they are the breed to which the general farmer can look for the means of putting his herd on the most profitable and economical footing.

The Galloways have the merit of being good beefing cattle if well fed, and of enduring hard fare if such be their fate. They may also, from the absence of horns, be a little better adapted for a shipping trade than others. But they take no high place as milkers, unless it be in isolated instances, and, in the presence of the Durham and Hereford, it is not possible to say they are the breed on which the ordinary farmer should place his reliance. There may, however, be situations, in so wide a country as Ontario—not to say Canada—where the hardiness of the Galloway would make it of value.

The Devons as draught cattle, and rich, if not very copious milkers, may suit those who have special need of animals possessing such qualities; while, for the home market they produce meat of a rich and excellent quality. But, as a breed to furnish the grade steer or heifer needed by the Ontario shipper, they will never, it may safely be predicted, take a high place.

The fact is, that, for the object the Commissioners have in view, as stated at the outset, namely, the several combined requirements of the Ontario farmer, the competition for first place lies between the Durham and Hereford alone. Of either of these two noble breeds there are a sufficient number in Ontario to supply the ordinary demand, although, the Durhams being the most numerous, the opportunity for selection by buyers is greater, and the services of Durham male animals can be, as a rule, most easily secured.

For attaining a given size and weight, in a given time and at the earliest period of its life—always assuming its treatment to be liberal and judicious—the Durham cannot be beaten. The prepotency, too, of the Durham male is universally recognized, and there is enough Durham blood in most of the present

farm stock of Canada to make assimilation easy and to secure certain results. By careful selection, too, of bulls from milking families, the dairyman may secure in the Durham the means of beefing his cows profitably when needful to do so, without diminishing the supply of the milk on which he primarily depends for his profits.

The only danger, if there be a danger, in the Durhams is, that, by too close breeding and, perhaps, pampering, a delicacy of constitution may be engendered and disseminated. Such a possibility has been hinted at, and, while it ought not to tell for one moment against the use of the Durhams at the present time, it makes it all important, (1) that no opportunity should be lost of giving the Durham stock in Ontario the benefits of imported blood; (2) that the intelligence and vigilance of breeders and veterinary surgeons should be always on the guard against such a possibility; (3) that the knife should be used unsparingly where anything short of the most vigorous constitution is detected; and (4) that all legitimate encouragement should be given to a second breed of cattle capable, approximately, of holding its own against the renowned Shorthorn.

That breed, so far as Ontario is at present concerned, is, if the evidence be correct, the Hereford. Strong in its prepotency, all but equal in early maturity in the stall, and more than equal in the pasture, to the Durham, with a constitution in which, so far, no trace of, or tendency to, any weakness has been detected, and with good milking qualities, the Hereford may yet prove to be a useful factor in the great work of giving to Ontario a class of cattle adapted to the varied demands of such a country.

It is for the agriculturist himself to judge to which of these two breeds he should look for his ally in the work of improvement, having due regard to all the conditions under which he is farming, and the precise objects he most desires to attain.

FEEDING.

A volume might easily be written on the subject of feeding stock, and in discussing the several systems and theories that find favour in the eyes of farmers or breeders in different sections of the country. All that is necessary in this place is to give as correctly as possible a *résumé* of the evidence bearing on this point as gathered from the statements of breeders, graziers, dairymen, and practical farmers. Professor Buckland, in his evidence, mentions that in the course of his earlier visits to the rural districts of Ontario he was met on one occasion by the question, "What breed of cattle do you consider best to stand starvation?" The Professor was a little startled at first, but says he soon found that all the interrogator wanted to know was, what breed would best endure hard treatment during the long winter. There is reason to fear such information is desired by too many farmers at the present time.

Mr. John Clay, Jr., speaks very strongly on this point. He says:—

"I believe my remark about the farmers badly housing and feeding their cattle in the winter applies generally to farmers in Canada. Their buildings are as a rule, draughty and cold, and the amount of food they give to their cattle is not enough to keep up their frames. This practice is very general throughout Canada, although you will find some of our farmers who keep their cattle in very good condition. I believe the percentage of farmers in Canada who neglect the proper feeding and housing of their cattle is fully sixty per cent. There has no doubt been an improvement made in that respect, but, in the county of Brant, where I live, you will find cattle kept in a most disgraceful condition. There is no doubt that, in an economical sense, the farmer loses by this practice. When he lets his cattle get down so low it takes them all summer to recover, and hence there is a great waste; the system is, practically, as wasteful as it is cruel."

Mr. Clay probably had in his eye some such practices as Mr. Iler, of Colchester, in the county of Essex, describes. He says:—

"Our grade steers, at three years old, do not weigh more than 1,000 lbs., live weight, that is grades of one or two crosses. We generally starve them pretty well for the first year, and starve them for the next two years, and give them all they can eat for the last few months that they live. That is the common system in our county. It is not very profitable to raise cattle when we can only get them to weigh 1,000 lbs. at three years of age. I know that the demand in England is for steers weighing about 1,400 lbs. at three years old. I don't think any of our cattle go to England, unless Mr. Walker sends them from his distillery."

A parsimonious habit does not seem altogether confined to Canadians at home. According to Mr. Hall it occasionally remains with them on the other side of the Atlantic. He says:—

"I have met with a great many Canadians, and I find that some of them '*put it in at the spigot and let it out at the bung hole.*' They are afraid to put their hands in their pockets to purchase the food which their cattle ought to have. When they come to our side and we propose to give the cattle some meal they say, 'Don't give them any meal; a bit of hay will do;' but if we have Canadian cattle in our possession a day or two, and give them meal, it makes them look pounds better."

Mr. Francis Malcolm has evidently met with some of these pseudo-economists, for he says:—

"Now those who feed beef cattle know that if they do not give their cattle more than what will merely supply the requirements of life, they will never make beef, and it is just so with cows; it is the extra food over and above what is actually required to keep the machine in working order, that can be turned into milk. The dairyman that is afraid to put in this extra for fear he will never see it again, is like the miller that, after being at the expense of building a mill is afraid to buy wheat to grind in it. As far as theory is concerned, one would think that if all the profit is derived from the extra food, the more of it the better. But to judge from the practice of many, it is evident they are unbelievers."

Feeding for Market.

From the mass of evidence on this point, it may be well now to select a few items showing how really successful and prosperous persons find it profitable to feed their cattle, and good feeding is generally found in company with good housing, for

the absence of one or the other will only be to verify the truth of Mr. Hall's homely proverb about "putting in at the spigot to run out at the bung-hole." Mr. Hobson says, and he only repeats what everybody at this time of day ought to know:—

"I think there should be good buildings for the housing of cattle. In the winter time the stables should be kept to a certain temperature, because if the stables are too cold it is well known the cattle would require more feed and would not do so well. If cattle are kept warm and comfortable they thrive better on a given quantity of food, and will sell at a much better price in the spring."

And this successful and prosperous farmer goes on to say:—

"I am decidedly of opinion that the most profitable way to feed cattle is to keep them in good flesh from the time they are calved until they are twenty-six or twenty-eight months old. I think it would pay better to sell them than to keep them until they are three years old. I think peas are quite as good as corn for feeding purposes; of the two I would prefer peas. I seldom feed meal to steers when they are on grass except when I want to get them in condition for the Christmas sales, and then I give them something exceptional. When they are on grass I would not give them any other feed, and sometimes they won't take meal at all. But, as a general rule there is no difficulty in getting them to eat meal when on pasture."

By this system Mr. Hobson says:—

"You can get a well-bred, well-fed animal at that age (twenty-six to twenty-eight months) up to 1,300 pounds or a little higher, and buyers are ready to take such cattle at good prices. When I say good prices, I mean about \$5.25 per hundred—that would be for what we call winter calves—calves bred in February and sold in May two years afterwards."

Mr. Hobson's winter management is described as follows:—

"I do not give the cattle water before feeding them roots. The roots are the first thing they get in the morning, and then we give them some dry feed, and then they are turned out for water during the day. The length of time they remain out depends somewhat on the state of the weather.

"I feed the cattle with food in the raw state. If we are likely to be short, I use the cutting box for hay, but when it has been selling at six or seven or eight dollars a ton, I don't think there is much advantage in using the cutting box. But by cutting the hay and mixing in a little straw you can make the same quantity go a great deal further. I do not feed much straw, however. I feed hay nearly altogether."

No one will challenge the experience of Mr. Miller, of Brougham, on such a point as this. He describes his method as follows:

"I have done a little at the soiling system—not very much. I use western corn largely for cattle feed. I have tried no other food for soiling. I feed that when the grass is bad in the summer time. I cut it green, and haul it to another field and feed it to the cattle there by spreading it on the grass. I have used the western corn in the winter time. If we have not turnips enough, I find it very good cut and steamed and mixed with chaff. I think the soiling system would answer a very good purpose even on a small farm. It would be a great deal better for a small farmer than to let his cattle run around the roads, as many do, as it would not only have the effect of keeping the manure on the land, but would benefit the cattle themselves.

“In the winter season I rely principally on turnips and hay. To the young cattle I give a little peas and oats chopped up—about half and half. Turnips are the principal roots I grow. I have had a few mangolds and carrots, but I consider turnips the most profitable and the surest crop. For the sheep and young cattle I cut the turnips, but to the others I feed them whole. I have not used a pulper on my farm.

Mr. Miller adds:—

“I think the most economical way in which a small farmer can raise his own cattle is to grow the stuff he feeds them on himself. If a farmer feeds his cattle all winter on straw, they won't come out in very good condition in the spring. My cattle don't get much straw; I feed them principally on hay; but if straw were mixed with chop or bran or something of that kind, they would do very well on it. I think they would do better on it if it was softened than if it was dry.”

Mr. Drury, who pursues a system of mixed farming, and raises steers for market, thus describes his system from the first winter of the animal's life to its final disposal. He says:—

“When the cold weather comes on I give them ground oats, pea meal, hay grass, or something of that kind. In the winter time I tie the calves up; but before that I let them out into a grass plot from the time they are weaned from the new milk, which generally takes about six weeks. When they are tied up I let them run out for exercise every day for about three hours. In the winter time my method is to give the calves, the first thing in the morning, a good feed of turnips. I begin with a little less than a peck, and go on increasing the quantity as they grow. After the turnips they get hay; I save the best and finest quality of clover hay for the growing calves. In the evening they get, instead of roots, pea meal, ground fine and mixed with chaff, and at nine o'clock at night they get a feed of clover again. After a calf is a year old I do not think it necessary to give it grain, provided it has good pasture. In the fall of that year it will come in in first-class condition and very hardy, so that you can keep it in good growing order for the winter. In feeding flax meal, great care must be taken to find what quantity a calf will do with. Sometimes a calf will get scouring by having too much. But if this is guarded against, you can keep the calves in good growing condition right along. Occasionally I find a calf that will not take the flax seed meal, even when it is put in the milk, and then I let it wait until it will take it. Sometimes also they have to be educated to ground oats and peas; but when once they take to this kind of feed, they will never lose track of it. I aim to have the cattle ready to go at any time between Christmas and the spring, so that I can sell them whenever the market suits and the buyer comes along ready to pay a good price.”

Mr. Drury adds to this by way of further explaining his method:—

“During the second winter I do not find it necessary to feed the calves meal, but I feed them roots and hay, and all the chaff they want. I give them roots once a day—in the morning—and hay twice a day. In the last spring before they go out to grass, I feed them meal for perhaps a month or six weeks, and then send them to grass. When the grass commences to fail I bring them in and stall-feed them with pea meal, turnips, and hay, or something of that kind. That would be about the middle of October. I think the best market is about Easter time. In feeding I endeavour to find the capacity of the animal, and give him just what he is able to stand. It is a very rare thing that you have to feed

more than a gallon of pea meal twice a day. I usually feed it dry with chaff. I consider five cents a pound for 1,600 pounds a good price ; that would be \$80."

Mr. James Cochrane, of Kilsyth, County of Grey, says :—

"I feed from seven to ten cattle in winter. I use peas for that purpose, and not corn. I have had no experience in feeding corn. We usually get the peas chopped. In feeding a three-year-old steer for the last two months, I feed ten to twelve pounds of pea meal a day, about a bushel of turnips, and all the hay he will eat. We depend on the peas for doing the fattening, and on the other food for keeping up the health and tone of the animal. The results of this kind of feeding have been satisfactory."

Among the persons carrying on mixed farming before the Commissioners, no one appeared to have reduced the fattening of cattle for the market to a more complete system than Mr. Peter Rennie, of Fergus. Mr. Rennie buys steers in the fall, breeds nothing on the farm, but selects the best beefing stock from the neighbouring herds. With good judgment Mr. Rennie will buy only grades, and the nearer to thoroughbred the better they suit him. He pays about four cents per pound in the fall, and prefers those which weigh from 1,200 to 1,400 lbs. As to feeding and general management, Mr. Rennie says :—

"We are very particular with respect to the regularity of feeding cattle. They are fed altogether four times a day.

"First, at six a.m., on turnips, then with chopped grain, fed in a separate box for the purpose, so that none is wasted, and the feed is never sour. They are then fed with hay, and allowed to rest.

"They are all curried carefully every morning. This is a most important matter in avoiding restlessness and irritation, especially in animals highly fed. They are well bedded with straw, as we want all the manure we can get. At noon they get some hay, and we have them turned into the yard for water and exercise.

"Between three and four p.m., they get their turnips again, and more hay. We give the hay in small quantities in their mangers, so as to have it clean eaten up each time. They are fresh bedded and left till seven p.m., when they get their chopped grain or cut feed with a little more hay. They are then left for the night."

He adds to this :—

"It is an essential part of our system to keep the cattle perfectly quiet, and free from irritation of any kind. I allow no rough handling or ill usage, and all dogs are excluded from the farm, in order that the cattle may not be harassed by them."

On this plan and with a farm of 210 acres, Mr. Rennie can feed as many as sixty head of cattle in one season, buying only ten tons of hay and 300 bushels of peas over and above his own produce, bringing the cattle up to 300 or 400 lbs. over their weight in the fall, and commanding top prices from shippers ; and, besides making a profit on the purchase and sale, after charging market rates for all the fodder consumed, he enriches the farm by a copious supply of manure, the secret after all of what he is able to accomplish. It is by such methods as this the greatest achievements in stall feeding are accomplished.

Mr. John Geary, of London, who buys and feeds on a plan very similar to Mr. Rennie's, says:—

“The steers I buy for feeding average about 1,100 to 1,200 pounds; most of them are three years old, coming four. I have fed a few under that age, but not many. I paid last fall from 3 to 3½ cents for steers, according to quality. In the spring they average, after being fed, about 1,476 pounds, and are worth about 5½ cents.

“I feed principally for the manure, and if I make the value of the manure as a profit, after paying labour and other expenses, I am perfectly satisfied. I am feeding stock as much to improve my farm as for any profit I make out of the steers.

“The cost of feeding a steer for six months, say from November 15th to May 15th, is, or rather has been to me, 23 cents per day.”

It is not pretended that the direct profit on the beast is large, if indeed allowing for occasional losses, there be any balance to credit of profit as between the buying and selling price, after charging feed and attendance. But, as both Mr. Rennie and Mr. Geary point out, there is an enormously enhanced yield of every crop, consumed at home and charged in feed at market rates.

Feeding Thoroughbreds.

Before noticing what is said as to the grass and distillery feeding, it may be well to quote the evidence of one or two breeders of thoroughbred stock as to their plan of proceeding, their object being somewhat different from that of feeders for market.

Mr. Clay, speaking of the system pursued at Bow Park, says:—

“After they are weaned we feed our calves largely on grain. We have been in the habit of giving them a little linseed cake, and during the last year or so we have been using it exclusively. I think there is a happy medium where, without feeding too much, you can keep calves in good condition. Our bulls we have to treat a little more liberally, in order to keep them in fine condition. I would allow the calves to run loose. I would run heifers loose altogether. Bulls are very apt to injure themselves when they get above a certain age if they are allowed to run loose. I would give the calves their grain in separate boxes, if possible, because those that are strong sometimes take advantage of the weaker ones. In the winter time we can do that, but not very easily in the summer time. The bulls I think it is better to feed separately by themselves.

“The principal root crop we grow at Bow Park is mangolds. This year I have 35 acres of the Long Mammoth Red Mangold. It is fair to state that, if turnips would grow successfully at Bow Park we would grow them, but it is not suitable land for turnips, while mangolds will grow in great profusion. I think thirty tons of mangolds to the acre is a good crop. In feeding them to cattle we pulp them and mix them with chopped hay or Indian corn, or mix in a little bran or meal, and give the cattle some every afternoon. We allow the mangolds to lie a short while after pulping them in order to cause them to ferment a little. They are a very laxative food if they are given immediately; but otherwise they are very beneficial.”

Mr. Benson, who, in addition to breeding Durhams, also fattens some steers for market, says :—

“At one time I adopted the soiling system largely ; but at present I have plenty of pasture, and I only adopt it partially. I should be decidedly in favour of a mixed system. The plan I follow is to keep the animals on the pasture, and I grow corn in the fields near the pasture, and we just throw it over the fence and let them eat it there ; but I always feed the grain in the stable, so that there is no hauling of green stuff at all. As soon as the pastures begin to fail I begin feeding corn.

“Having regard to the health of the animals, I consider the mixed system much the best for a herd. I think the constitution of an animal is reduced by keeping it in the stable constantly. The more you can keep breeding animals in a state approaching the state of nature, the better it is for them ; give them plenty of air and exercise, and, as soon as the nights become cold, stable them. I approve of their being kept in buildings made as warm as is consistent with good ventilation.

“I do not give any Indian corn to the breeding animals, I only give oats and bran. I use Indian corn in fattening, if I have nothing better. I could use cotton cake, or pea meal, or oat meal. . . . I use flax seed by grinding it up and giving the cattle a pound or so, and I prefer doing that to using the cake. I used to feed a pound and a half of flax seed to every animal, and I bought it in the neighbourhood where it was raised at about two cents a pound. It is about the same price in England as here, but with me it was cheaper, because the flax seed was grown in the neighbourhood. At present it is three cents a pound, and therefore, I think three pounds of corn or grain is better than one pound of flax seed. Still, I always keep it to feed it to the calves.”

Mr. Jardine, the breeder of Ayrshire cattle, already referred to, gives the following as his system of management :—

“In the summer time I maintain my herd on grass, and always soil them for from two to three months. I commence soiling very early. I sow rye in the fall and cut it as early as the 10th of May. I commence with rye ; the next green fodder is peas and oats, which I find the best of all ; and then corn, which is sown at different times and lasts till the fall. I have tried vetches and lucerne, but they did not do well with me. I certainly prefer soiling to grazing, so far as the quantity of milk produced is concerned ; but still I must have a run for the cattle. You cannot keep up the quantity of the milk so well on pasture as you can on green fodder. I find less difficulty in keeping up the standard of the milk in winter, for that reason, than I do in summer. At the present time I am soiling.

“In the winter I commence on roots and cut feed, and I steam everything together. I put in my roots, and bran, and cut corn-stalks, and chopped stuff, and steam them all together. I feed very little hay. I have an agricultural steamer which came from Rochester, and it will steam from twenty to forty bushels at a time. I find that the cattle do better on the steamed feed, because once or twice when I did not use the steamer they fell off in their milk. I only feed a little uncut hay in the evenings after the regular feedings. I cut up all my straw and corn-stalks. The roots I feed are mangolds and turnips ; I think they are good for dairy purposes, but I prefer the mangolds. I have never had a case of abortion in the Ayrshire herd ; I have never known a case to occur among our cattle since we had the Galloways.”

Dairy Feeding.

Mr. Malcolm, who feeds as a dairyman, says:—

“As soon as the cows are put dry—which is usually about Christmas—they are put upon straw, chaff and a little hay, with a feed of cut turnips morning and evening. If I have abundance of straw I do not cut it, but prefer to allow the cows to select the best, which they cannot do if it is cut. What they leave is used for bedding, and so worked into manure. I endeavour under this treatment to improve their condition, and therefore, if any are very thin in flesh, they are fed something more nourishing.

“In fact I consider it the backbone of successful dairying to get the cows up in fine condition in January and February, and if one kind of food won't do, recourse must be had to another more nourishing. I have no certain rule to go by in feeding either this or that; it will all depend on their condition and time of calving.

“As they near that period I increase the rations of the more nourishing food, as the growing calf is a heavy drain upon the cow. When they do calve they are fed more or less chop grain twice a day, mixed generally with wheat-bran and all the good hay they will eat. At the same time I keep up the turnip feeding, and if I have a good supply I increase the quantity.

“They are brought upon the grass gradually, a sudden change having a tendency to make them too loose in their bowels. Through the latter half of May and the greater part of June, pasture is generally very abundant and nothing else is needed, and in fact so long as pasture is good it is quite sufficient, but when it begins to fail, the cows must be fed or fall off in milk. The general practice is, to let them take their chance, and the owner the consequences, till fodder, corn, or after-grass can be obtained. The falling off is generally so serious, and impossible to restore for that season, that I concluded last summer to try bran.

“I commenced on the 20th of June, and fed bran till about the middle of September, when abundance of corn took its place. I put them in the stable morning and evening after milking, and fed each about three pounds. This did not keep them up to the full flow of milk, but unquestionably it did to such an extent as paid well for the bran. After the hay was cut, they were fed a little in addition to the bran, but some would not eat it. The bran was fed dry. This was attempted partly by way of experiment, and I am very well satisfied with the results.

“Fodder corn is perhaps the most reliable green food for August and part of September; then to have a piece of mangold for October and November is good practice, but whatever it be, *the most economical dairying is liberal feeding.*

“Another important matter is comfortable, well-ventilated stables. A certain amount of heat must be kept up; if this is not attained by good walls, the cow uses the food she eats for that purpose. If those that are behind in this matter could only see their animals burning their food in order to keep warm, they would open their eyes to the importance of a good stable, and would, no doubt, soon procure one.”

The subject of feeding on the soiling system, will be found very fully discussed by Professor Brown, in a paper read by him before the Dairymen's Convention on the 20th April, 1880, and published with the evidence on General Farming, in Appendix G. It is one of those open questions on which few persons would desire to pronounce dogmatically in face of the many arguments by

which it may be supported or criticized. For the ordinary farmer, however—especially in view of the requirements of the shipping trade—it is probable that, in most instances, a mixed system will be found most convenient as well as most economical, while it affords the best preparation for the animals themselves.

Grazing for Market.

The practice of graziers is to buy cattle either in the fall or spring, as they may find best, and ship them to Europe in the following August or September. Mr. Simmons, of Lobo (Middlesex), who pastures a large number of stock annually, strongly advises a moderate quantity of meal in addition to the green feed. He says:—

“I believe it would pay fifty or one hundred per cent. of the money invested to feed meal, six pounds per day, to cattle on the grass, more especially since the markets have changed, and we are preparing our stock for the English trade. The cattle would be ready to go to market earlier in the season, when it costs a great deal less to ship, and the insurance would be much less on account of the more favourable weather.

“In raising cattle, they should be got off the grass as soon as possible. I delivered forty this week. They were just wintered through pretty well with a little meal, and they are fairly good cattle now, and they will command a price of five cents. A number have been sold the last few days at five cents. Cattle that have been fed through the winter a little extra, and a portion of them given meal this summer on the grass, will run over five cents; and if those cattle had not been fed grain, it is not likely they would have commanded more than four and a half cents in the fall. If these cattle were kept through, as cattle ordinarily are, they would not weigh more than they do now, which is an average of 1,325 pounds, and they would not be worth more than four and a quarter cents.

“The best grain to feed, of our own raising, is peas, as I believe they have more fattening quality in them than anything else we can feed to our stock. Now that we cannot raise peas, we have to feed corn. Barley is very good, but not so good as corn. I used to feed a good deal of peas, but since the pea crop has failed I have fed corn. I always had an idea, from the return I got, that peas would pay as well at sixty cents per bushel as corn would at forty-five cents.”

Mr. John Smith, of Harwich Township (Kent), is another buyer and grazier, buying, in February, cattle from two to four years old. He says:—

“As a rule, we buy our cattle in February, and feed them hay and good straw until the grass is ready. We do not feed them in the stall in the spring, but out of doors. We find we have to start as early as that in order to get the cattle we want, and that it pays us as well to feed them.

“We use clover hay and straw to feed them upon. We use some corn straw occasionally, and it is very good food; we rather prefer it to hay, but we require a larger quantity of it; I don't know that it is any more fattening than hay. We have considerable pasture land, between what we have ourselves and what we rent—about 500 acres altogether. Good pasture, with very little bush on it, is worth about \$3 per acre.

“When we stall feed the cattle we do not ship until spring; pastured cattle for England go about September 1st. If they are not ready, then we feed them

corn on the pasture and have them ready to go off. We sell them the same fall—all that are fit to go at that time.”

Mr. Smith was good enough to tell the Commissioners something of the profits of the business he is engaged in. He says :—

“For such steers as we buy, the price we pay is about \$25, though this year it has generally been about \$30 for first quality. The average weight of these cattle would be from 900 lbs. to 1,100 lbs. We have to pay about three cents per pound for good cattle of that description, and we pay less for inferior ones. We get many of these animals for \$15 to \$20, weighing about 800 or 900 lbs. We find among the farmers a tolerably abundant supply of fairly good grade cattle. We buy for about twenty miles round Chatham.

“Our cattle sold for 5 cents a pound this spring after feeding in the stall, but not on the pasture—those that were bought the year before. If the market is good in the fall, we sell them that season; but, if not, we put them in the stall and feed them. We find that pasture-fed cattle bring good prices; those sold off the grass generally bring about $4\frac{1}{2}$ cents per pound. Of course there is something comes off the price for freight, as the further west we go the freight will be the greater. We sometimes buy good young cows, but they must be well bred. A good, well-bred heifer, will put on more weight than a steer, and sell for the same on the English market.

“We claim that it costs us \$1 per month per head to feed cattle—say from February until they are put into the stable in the fall—say about the month of November. Under ordinary circumstances we can pasture up to the end of October. After we put them into the stable they cost us about \$4.50 per month. We keep them on that food for about three months. The cost of the animal, up to selling time, would be about \$48.50, and the average weight about 1,350 lbs.

“That gives us a profit of about \$6 per head, but when they are sold out of the stable they bring more than that. If we sold them in the spring, they would bring half a cent per pound more, or on an average from \$60 to \$70 a head in February. It would not cost us so much to feed them another three months. It does not matter to us whether we sell them in February or in May; we rather prefer to clear them out in February, so as to be ready for the next year's work.”

Mr. Albin Rawlings, of Forest (Lambton), describes his method as follows :—

“I pay all my attention to grazing. I buy the cattle when they are two or three years old. If I buy them in the fall I buy them at two and three years of age, and if in the spring I buy only cattle three years of age. The cattle I purchase in the spring I put in the pasture about the first of April. I like to have them weigh at that time from 900 to 1,200 pounds, that is when they are three years old. We buy the best grades we can get.

“I leave about one-fourth of the grass on the ground in the fall, so that in the spring I have that old grass, and can get my cattle earlier on it. They eat that grass by the middle of May, and then the young grass is stronger and better.

“In the spring I first put my cattle on where there is rough grass. Last year I put them on in the last week in March. I find that the cattle on this grass, and hay, will gain as fast as if they were in the stable, and fed with meal and turnips. The heaviest I ever knew a steer to gain in one summer was 700 pounds. This animal was fed only on grass. I don't feed my animals on anything but the grass; I give them no meal at all.

“I would recommend farmers here to feed their cattle pretty well during the winter. One of the best things to feed them on in the winter is corn and straw

cut into chaff with a little meal twice a day. Cattle thus fed in the winter will come out in the spring far better.

“ Our farmers should hold their cattle till all the distillery cattle are shipped. They should not sell their cattle till July. The cattle should be allowed to have the whole pasture from spring till fall.

“ They should not be changed from one pasture to another. It is a great mistake to do so. I have tried the experiment; a man I knew changed his cattle to different pastures every week; I allowed mine so many acres for the whole summer; the result was that mine sold for \$8 a head more than his. I attribute my increased price to not changing the pastures. I observe when you put fresh cattle in fresh pastures they will eat and gorge themselves, and afterward they will not be able to eat. When you keep them in the same pasture they eat regularly and do much better.”

Permanent Pastures.

Although the maintenance of pasturage is a branch of the farmer’s business, more correctly, perhaps, belonging to cropping than to stock feeding, it is so closely allied to the grazier’s operations that it may as well, perhaps, be noticed here. It is customary to consider permanent pastures, except in the case of rough land, where a stunted growth may afford a very doubtful subsistence to scraggy beasts, to be an impossibility in Ontario. Save in Muskoka, where pastures fresh and vigorous, seeded down ten years ago, were found, a result supposed to be largely due to the milder climate, the abundant snowfall, and the large amount of moisture in the soil, no permanent artificial pastures were seen during the whole of the journeys of the Commissioners. Mr. Rawlings, however, claims that he has pastures which have stood for from ten to twenty years. He has tried many experiments in order to ascertain the best combination of grass seeds to accomplish this desirable result. First he sowed the red and white clover, and timothy, but now he adds other ingredients, the following being his recipe:—

Red clover.....	3	lbs.
Alsike.....	2½	“
Dutch (white)	½	“
Timothy	5	“
Irish cocksfoot	3	“
Orchard grass	3	“
Lucerne.....	2	“
—		
Total	19	lbs.

That is the quantity for one acre, and will give a permanent pasture. How the mixture operates he describes as follows:—

“After the first year the clover begins to give out. The orchard grass and cocksfoot are up about eighteen inches high when the timothy is only about four inches, and the cattle get this first, and then the timothy comes on and the alsike and white clover. The grasses I have recommended above come up at different periods, and they make a good bottom, and where you have a good bottom you have a good pasture. The timothy, I think, stands the drought the

best. I haven't had any hay from these pastures for three or four years. I got a great deal of experience about grazing in New York State, where they leave one-third of the grass on in the fall, so as to let the cattle on early in the spring."

His method of sowing and managing the pastures is thus referred to:—

"I have been sowing timothy in the fall latterly. I would recommend to have the land in a proper state of cultivation and to sow down without any crop.

"I put my cattle to graze the first year of sowing. On the best pasture I have I sowed the timothy in the fall, and the other grasses in the spring. I would recommend by all means to sow the grass seed in the month of March when the land is very dry and the earth is full of creases. The seed falls into the cracks, and when rain comes the earth fills over them. This year I advised a person to sow his grass about the 8th of March, and it has caught very well all over the field. My permanent pastures, thus laid down, have lasted twenty years, some of them.

"The alsike remains the best grass we have in Canada for milking or grazing purposes."

Top Dressing.

Mr. Rawlings adds, with regard to the treatment of pastures:—

"To keep up the fertility of the pasture I recommend top dressing with either leached ashes or any manure you can get. I would not recommend any special manure. Land plaster is not so good as ashes, on light soil. Where we have done top dressing we have got twice as much grass."

Professor Brown also advises the use of mixed grasses, and in rather a larger proportion to the acre than Mr. Rawlings. Mr. Brown's recipe is as follows:—

Timothy	6 pounds.
Orchard Grass.....	3 "
Red Top	1 "
Meadow Fescue	1 "
Kentucky Blue	1 "
Yellow Oat	1 "
Fan Oat	1 "
Bent Grass	1 "

Making 15 pounds of grasses proper, along with the following clovers:—

Lucerne.....	5 pounds.
White (or Dutch) Clover	3 "
Alsike	1 "
Red... ..	1 "
Trefoil	1 "

Making 11 pounds of clover, which, with the 15 pounds of grasses, make 26 pounds of seed altogether."

Professor Brown adds:—

"The proper management of permanent pasture involves a rich surface, spring seeding, easy first year grazing, and top dressing every third year, either with compost, bones, or farm-yard manure. Nobody can expect to keep up permanent pasture unless he provides it with some nourishment."

It does not follow that precisely the same grasses will be equally suitable in

every situation, nor yet that permanent pastures can be maintained everywhere, but it will be well for all who have an apparently favourable opportunity, to test the means thus suggested, always however remembering, that judicious treatment and management are as necessary for pasture as for other crops, and that the best combination of grasses may fail if they are not properly treated.

Distillery-Fed Cattle.

As a market for young stock or for cattle suitable for beefing purposes, but not in full condition for the market, the farmer has indirectly an interest in distillery feeding. Several thousand head of cattle, are fed annually at the distilleries of Messrs. Walker, near Windsor, Messrs. Gooderham & Worts, at Toronto, and Mr. Wiser, M.P., at Prescott. Messrs. Walker, also, pasture a very large number on some extensive marsh lands in the county of Essex. The firm commence buying in February for pasturing, feed the cattle first on coarse fodder, such as cornstalks or straw, pasture them for six months, and, in the fall, put them on distillery slop. For the distillery only, the cattle are bought in September and October, and at once put into the barns. Mr. Walker says:—

“They usually weigh when purchased 800 to 950 pounds at two years, or 1,000 pounds and over at three years old. During the winter they are fed entirely on distillery slop, except that they get a little hay to make a cud. For the last three months of feeding they get some barley ground, or corn meal, mixed with slop. That brings them to the spring or shipping time.”

The weight of the cattle when purchased is low, and would indicate that many of them are scarcely so well bred for feeding as the purchasers would desire. Mr. Walker says of the prices paid and received:—

“Prices vary much in different years, and quality always governs prices. Last year the price averaged a fraction over 3 cents per pound. We give one-fourth to one-half cent more for extra grade and heavy beasts. We were offered close upon 5½ cents per pound for nearly all our cattle this year. We depend for success chiefly on the selection we make when purchasing. The average weight in the spring was about 1,300 pounds. We should commence shipping when navigation opens, and get them all off by the 1st of July.”

The firm shipped over 2000 head to Europe last year. Mr. Walker alleges there is no prejudice against distillery-fed cattle. The meat he says is “juicy, tender, and fine; the dry meal hardening and giving it firmness.” This is quite confirmed by evidence from the other side of the Atlantic. Mr. Walker complains, as do all buyers, that steers or heifers of the right stamp are not easily obtainable. He says:—

“A sufficient supply of young cattle of the quality we need is not easily obtained. *If farmers would only raise good grades, they would find a beast of that class weigh, at a given age, 25 to 40 per cent. more than a common animal, and be a better quality at that.* Our own steers will run 1,300 to 1,400 pounds, live weight, at two years old; that would only apply to grades. Two steers we

bred, put in at two and one-half years, at three years weighed, together, 4,400 pounds. They weighed 1,600 to 1,700 pounds each when put in. Until put in they had been fed on distillery slop, with hay and grass. When put in they were fed on slop till close upon the end of feeding, if not altogether."

Mr. Wiser has furnished the Commissioners with a statement describing his system of management. His practice is to buy cattle weighing not less than 1,000 to 1,100 pounds, which in his opinion is quite light enough. He goes on to say :—

"They will then go out of the stables in the spring weighing fifteen and sixteen hundred pounds, which, in my opinion, is the most profitable way to ship, as it costs no more to freight a 1,500 lbs. bullock than one weighing 1,000 lbs., making a saving of 50 per cent. in the freight alone—a very large item in shipping a large number of cattle."

The daily routine of treatment is as follows :—

"At six o'clock in the morning they are fed hay, all they will eat up clean in two hours; at eight o'clock they are fed wash from the distillery; at eleven o'clock again fed wash; at two o'clock hay again; at, say, five o'clock the troughs are filled with wash and all the hay they will eat through the night, making six feeds in the twenty-four hours, three wash and three hay."

Mr. Wiser makes the following remarks on the quality of distillery-fed cattle :—

"As to the relative merits of distillery-fed cattle as compared with corn-fed stock, I would say, I have sold my distillery cattle, in Boston, against Kentucky and Illinois blue-grass and corn-fed cattle, and could invariably sell my cattle for as much as they could their stock. I was never outsold in any market for the same quality of cattle.

"My own opinion is that no beef equals distillery-fed cattle. It is juicy and tender, as it can not help being, from the mode of fattening. The cattle are well housed, kept warm, take on flesh rapidly, and are not exposed to cold or storms, which, in my opinion, have a tendency to harden and dry the meat. There is a prejudice, I know, existing with some in this matter, but I do not think it is borne out by the facts. There cannot be any great difference when I tell you I doubt if one buyer in fifty in England can tell the difference between a distillery and corn-fed or farm-fed animal."

Asserting that a good beast will sell in any market, Mr. Wiser offers the following excellent advice to Canadian farmers and shippers :—

"I cannot impress too strongly upon our Canadian feeders, if they expect to realize the highest market price for their stock, the necessity of sending only good, heavy, fat stock to market. It is a waste of raw material to send poor, half-fattened cattle to England. The market is too far away, and the expenses are too great, to send poor cattle there and expect to get the price good stock will command in their markets."

Treatment of Calves.

As on the treatment of the young creature in the earlier stages of its existence depends—however little this may be remembered—the future condition of the mature animal, it was deemed desirable by the Commissioners to invite information very fully respecting the management of calves.

In the case of thoroughbred cattle, the calf is usually allowed to follow the dam, but when the latter is very valuable, a foster mother is found for the calf for two or three months, and the cow is, if possible, dried off. At Bow Park the calves are usually dropped in the fall and winter, or between September in one year and June, at latest, in the next. In the winter they have exercise in the day, but in summer are turned out at night. They run in boxes with their foster mothers. Ordinarily they are weaned at six or seven months, although very choice stock are left to suck the cow as long as they choose to do so. Their subsequent treatment has already been noticed. Mr. Hobson, after describing the treatment of the young calf, which, in his case, is similar to that practised by Mr. Clay, says:—

“Sometimes I feed with the pail and then I use milk pretty liberally; I also give them all the meal and bran they can eat. I usually feed my calves peas and bran, or peas, oats and bran. I used to feed corn, but the duty on that article hurts us a little; last fall we could get peas for 55 cents a bushel, and I found them cheaper than corn. During the first winter I would let the calves run loose. I think that is better than having them tied, as they should have exercise. During the first winter I feed them on hay, meal, roots—turnips and mangolds, but principally turnips—and bran, which I have used very largely of late years, and I think, with great advantage. If I saw cattle were losing flesh under the system I was following, I would vary their feed a little—give them more meal, perhaps. But I would seek always to have them kept fat.”

The use of bran as a feed for cattle is very strongly recommended by Mr. Hobson, as well as others. Both as a wholesome and very economical diet, and as supplying a most valuable manure, bran deserves to be used much more freely than it has been hitherto.

Mr. Miller's management of calves is described by him as follows:—

“I think it pays best to have the calves dropped towards the end of the year. I would sell the bulls when they are from twelve to fifteen months old. They are commonly bought in the spring for breeding purposes—about March or April. I usually keep my calves shut up in the house, and let them to the cows twice a day, morning and night. We usually keep them shut up for six or seven months, and give them grass (when I can cut it), oats and peas, and a little bran. I allow the calves to run loose; I think this is better than tying them, as they need exercise. After they are weaned I allow them to continue to run loose until winter, and then I tie them up. I am speaking now of heifer calves. The bull calves I allow to run loose in separate boxes.”

Mr. Drury, whose general system of farming is more in keeping with that of the ordinary run of farmers, adopts a rather different method. He says:—

“I aim to have my calves dropped about the last of March or the first of April. I take them right away from the dam at once, and never let them suck at all. I wean them and milk the cow, feeding the calf for seven weeks on new milk. I do not add anything during that time to the milk, and I give them all the milk they will take. I believe that is a more economical plan than to allow the calves to follow the dam. If you allow a calf to run with the dam, the running about is likely to keep it poor. At the end of seven weeks I feed the calves

skim milk. I do not wean them suddenly, but give them a feed of new milk occasionally before finally weaning them, in order to accustom them to the change. Sometimes the change will result in scouring, and I think it well to give them ground flaxseed boiled with the milk."

Mr. Drury's subsequent treatment of young stock has been already noticed.

Mr. Benson, who raises, it will be recollected, thoroughbred stock, describes his plan as follows:—

"When a calf is dropped we let it stay three or four days with the cow, and milk the cow all we can, in order to keep its bag in a good state. This prevents inflammation in the bag. As soon as the cow's udder gets into a safe condition, I separate the calf from the cow, put it into a place by itself and accustom it to be halter-tied a little every day. I give it as much milk from the cow as it will take three times a day. If it is a good strong calf, I begin quite early, perhaps in the second week, to mix a little flaxseed with the milk, perhaps a teaspoonful of boiled flaxseed. We feed it for about a month on new milk, and then we begin to feed it on skim milk with flaxseed, and at the end of ten weeks or three months we do not give it anything but skim milk and flaxseed. I generally find that the calves do very well on that fare. I have a little field with a nice shed in it, and supplied with water, and when they become big calves I feed them with milk twice a day and let them have all they want of ground oats mixed with a little bran. I think bran is a good feed to produce milk. I always feed my thoroughbreds with a mixture of, perhaps, two-thirds oats and one-third bran; but I never give them any corn meal. Bran has a good deal of phosphate in it, and keeps the calf in good condition."

In Kent and Essex, the Detroit market for calves offers a temptation to the farmer, to send them over to the butcher at a very early age, the value being generally reckoned at about a dollar for each week of their existence. Mr. Alanson Elliott of Colchester (Essex), says, in this connection:—

"We do a large trade in calves in our part of the country. The hucksters buy them and take them to Detroit. These calves are sold at from three to eight weeks old, and they bring from \$3.50 to \$10. They average about \$1 a week. I let my calves suck the cow, as that is the least troublesome plan, and after the calves are taken off we milk the cows. We only let the calves suck the cow in the evening and morning; they are kept from them all day."

Mr. Rudd of Eramosa (Wellington), who breeds Devon cattle, says, of his method of managing calves:—

"I always allow the calves to suck their mothers. I generally have the calves come about the first of April—sometimes a little sooner and sometimes a little later. In winter we generally feed them chaff and turnips, and sometimes cut feed—a small quantity of hay mixed with straw and a little bran. I do not give breeding cows any meal—not even after they calve. I give them bran and turnips and hay after they calve."

Mr. Hunter, the Shorthorn breeder of Alma, says on this point:—

"The calves require more care for the first two months than the calves from other cows, but after that two months they are equal to any other calves. We allow our calves to suck their mothers. I do not care to have them come sooner than October, if possible, and from that time till April. I think it is more profitable to have them come sometime before January. I generally sell the bull calves at from eight to fifteen months old; sometimes they are two years old before we

get them sold. The calves that come in October we allow to go with the cow for from six to eight months. Towards the spring, when the cow goes on the grass, we take the calf from it, and feed it on cut hay mixed with bran. We keep all the young cattle housed, and feed them on green feed while we can get it, and afterwards on cut hay mixed with bran, and perhaps some boiled feed. We feed the bull and the heifer calves in pretty much the same way. The calves that come in the spring we prefer to let run with the cows during the summer until the very hot weather comes. In the first winter we give the thoroughbred calves all they will eat, and we generally mix their grain with bran and cut hay—or wheat chaff, which we prefer even to the cut hay—their stomachs seem to keep in healthier condition upon it than upon the cut hay. In raising calves, I think it is very important that they should be well attended to during the first two months. During the first six weeks or two months they should be entirely kept away from feed until their stomachs will digest it and they have a cud to chew. The only grade cattle I keep are a few milch cows for the house, and occasionally we have some young heifers that we require for nurses. We do not do any feeding at present; we did before we kept Shorthorns."

Mr. Armstrong, of Eramosa, has his method of calf-treatment also to describe. He says:—

"When a calf comes in the end of the year—in October or November—I let it suck all winter. I have stalls, where the mother stands at one side, and I tie the calf at the other. I begin to feed a little chopped stuff and hay and turnips to the calf, while it is sucking, and I keep on feeding it in that way until the grass comes, and I then put it out to pasture and do not bring it in again until the fall. I allow it to suck the mother for nearly nine months—until she is going to have another calf. When we keep the mother and the calf together they seem to be quieter than when we keep them separate."

Mr. Watt also prefers to have the calves dropped in the latter end of the year, or early winter. Bull calves are then ready for service in their second spring.

It will be observed that all the witnesses differ in some details. Each has his own method of treatment, and that of one may be, in some respects, better than that of another. But one principle runs through them all—that of giving the young calf a good foundation at the outset. There is no starving for the first year or two, and then forcing the animal into marketable shape in the third. The policy of every successful and intelligent breeder is to feed well and systematically from the first hour of the creature's life.

Oil-Cake as Cattle Feed.

Before leaving the subject of feeding, some reference to the use of oil-cake as a feed may be desirable. It is seldom mentioned by the agricultural witnesses, or if mentioned, only spoken of incidentally.

Mr. Clay mentions it as a good winter feed for breeding cattle, remarking "it will answer almost as well as green food." He further expresses the opinion that "oil-cake is healthier food in every respect than grain." Mr. Dickson mentions the use of ground oil-cake as a substitute for peas, since the failure of the

pea crop. Mr. Benson uses flax seed, ground, in preference to the cake. Professor Bell recommends it as one of the substances containing the most nitrogen, and therefore producing the best manure. As a matter of fact, oil-cake is used to a very limited extent, although largely manufactured, in Ontario, and is exported to Europe from this country, where Canadian cake commands the very highest price in the British market.

Desiring to bring the question of oil-cake feeding more prominently before the farmers of the Province, the Commissioners invited Mr. Robert W. Elliott, of Toronto, a large manufacturer of the article, to make a statement on the subject. From Mr. Elliott's very interesting evidence, it appears that in 1878 no less than 160,000 bushels of linseed was grown in Ontario, the exportation of cake to Great Britain that year being about 2,500 tons, and the home consumption only some 1,000 tons. As a contrast to this sparing use of so valuable a product in Canada, it is shown by the returns, that, in 1878, besides importing ten million bushels of flax seed, Great Britain also purchased from abroad 230,000 tons of oil-cake, in addition to rape-cake, cotton-cake, etc. In other words, allowing for a difference in population, Canada used only one pound of oil-cake for every forty-three pounds which ought to have been used to equal the British consumption. The growth of the seed here may be carried on to an unlimited extent. The cake costs the Canadian farmer some \$15 to \$16 a ton less than it costs the English consumer. If used in Canada as feed, the oil-cake would bring just twice as much in meat as it does in a raw state, besides producing a most valuable manure; and yet the quantity consumed here is quite inconsiderable.

As to the results of feeding oil-cake to cattle, it is asserted that, with stall-fed cattle, it produces eighty pounds additional weight to every hundred pounds of oil-cake fed; and then the residue is of great value as manure—very much superior to the manure from ordinary feed. In England it is valued at about \$18.50 per ton of oil-cake fed. In England it is a common thing to insert a stipulation in land leases that so many tons of oil-cake per annum shall be fed upon the land. Oil-cake is worth in this country from \$32 to \$35 per 2,000 pounds by the car load.

Now, if one hundred pounds of oil-cake fed to an animal will produce eighty pounds of beef, or a ton of cake 1,600 lbs. of beef—a ton of cake costs, as already shown, from \$30 to \$35, say \$32 on the average. But that ton of cake will not only produce 1,600 lbs. of meat, but also manure, worth, according to the value put upon it in England, of \$18.50 for application to the crops of the farm, thus reducing the cost of the ton of meat-producing material to some \$13.50 from its first cost in Canada, and making the actual net cost of the 1,600 lbs. of meat only about nine-tenths of a cent per pound, providing the value of manure in Ontario were the same as in England. There are other charges, of course, to be taken into account, but, as between oil-cake and beef, the result is, on the best authority,

just as stated. In fact, no manure produced from any of the ordinary feeds approaches in richness that from oil-cake. The manure from turnip feed is reckoned in England at about sixty cents per ton for every ton of turnips fed ; from Indian corn, at about \$7 for every ton of corn feed ; and from peas and beans, at \$14 for every ton of feed. In other words, oil-cake-feed manure is fully 25 per cent. more valuable than pea-feed manure ; 250 per cent. more valuable than Indian-corn-feed manure, and thirty times more valuable than turnip-feed manure. As to the comparative cost of oil-cake with other feeds, Mr. Elliott says :—

“ With regard to the comparative prices of oil-cake and other feeds on the farm, oil-cake would be worth about $1\frac{3}{4}$ cents a pound, corn not quite a cent a pound, and the peas nearly $1\frac{1}{2}$ cents ; but neither of these will do so well for milk and fattening as oil-cake. I don't think Indian corn for any purpose is as good as peas. The oil-cake is solid food, having had all the water squeezed out of it, while if you take 100 lbs. of turnips, you will find that there is only about 10 lbs. of solid matter in them.”

Mr. Richard Hall, than whom, on the quality of respective feeds as exemplified in the condition of the animals sent to market, there can be no better authority, says :—

“ I am very favourable to the use of oil-cake as food for either stall-fed or grass-fed animals. It is now universally used by farmers in England and Scotland. Canada exports large quantities of it to England, and the Canadian oil-cake is highly appreciated there. In feeding oil-cake I would begin with three or four pounds and finish with eight pounds a day ; a large animal would take a little more. In a large city like this, where they are feeding so many in stables, manure is of no value, but in the country it is, and nothing makes so good manure as oil-cake. I would also recommend oil-cake for distillery cattle. . . .

During the last two or three years the character of the cattle shipped from Canada has decidedly improved, and their reputation has made rapid strides. I would strongly advise the introduction of oil-cake as a food ; first, on account of its nutritious qualities, and in the next place, because it is a food that can be continued during the sea voyage.”

The cheapness with which coarse grains can be grown in Ontario no doubt limits the necessity for using oil-cake to so large an extent as it is employed in Great Britain, but for animals preparing for the market, especially those which have been grass-fed, or in all cases where it is desired to turn out a first-class article, oil-cake may, if in no others, be used liberally, and to great advantage.

Profits of Cattle Feeding.

That feeding cattle is in its pecuniary results profitable, and, under ordinary circumstances, largely so, is not questioned by any of the witnesses ; although they arrive at that conclusion by different methods and on different grounds. The buyer of stock for feeding is able to give with tolerable exactness the cost and profit on his undertaking. Mr. Smith, of Harwich (Kent), it will be observed, who buys cattle in February, feeds them roughly till the season admits of a resort to the pastures, and then either ships, or stall feeds till the following spring. He

estimates the cost of feeding to be \$1 per head per month during the first period, and \$4.50 per month in stall. He buys at prices ranging from \$25 to \$30 per head, and, if he stall feeds them, realizes five cents per head on an average weight of \$1,350, thus showing a very handsome profit. For cattle off the grass, the price would be about $4\frac{1}{2}$ cents per lb., and the profit not over some \$6 per head.

Mr. John Geary, of London, buys steers in the fall from 1,100 to 1,200 lbs. weight, at 3 to $3\frac{1}{2}$ cents, brings them up to 1,400 to 1,500 lbs., and sells them at $5\frac{1}{2}$ cents; the cost of feeding being, he reckons, about 23 cents per day for six months, or \$41.40 per head. If the average cost be $3\frac{1}{4}$ cents, and the average weight at the time of purchase 1,150 lbs., the cost of the steer in the spring, not allowing for any casualties, would be about \$78, and if sold for $5\frac{1}{2}$ cents on an average of 1,450 lbs., the account would be almost exactly balanced. But then, it will have been noticed, Mr. Geary remarks that his chief object is the manure, and if he makes the value of the manure his profit he is perfectly satisfied.

Mr. Rennie appears to act on pretty nearly the same principle. And it is probable the bulk of the farmers who sell their young stock to such feeders as those named are content with the same form of profit. The cost to the breeder of bringing stock up to a given age is less easy to ascertain. In fact it is hardly attempted by any one. It pays, they all know, to breed good beefing stock; it pays, the feeder knows, to buy and feed good stock; but just how it pays is not so easy to show in so many figures. Professor Brown meets the matter in his evidence, as already mentioned, very boldly. He, of course, proceeds on facts as ascertained by himself or other careful observers. He says:—

“The average weight of the steers we have been accustomed to handle is 1,745 pounds, and I can give you accurately the cost of bringing that animal to that condition at three years old. The milk necessary to maintain that steer, while a calf, will cost \$23; it will eat \$60 worth of roots, \$44 worth of grain, \$21 worth of fodder of different kinds, and \$15 worth of pasture, and its attendance, taken in connection with the attendance of a large number of other animals, will cost \$12, making a total of \$175 against the steer. The largest sum which can possibly be received at present for that animal is \$105. There is, therefore, an apparent loss of \$70. You are aware that no animal will pay directly for the food it receives.”

Here there is an apparent paradox. It is gravely laid down that every beast bred and brought to a condition for market, allowing the best prices to be got for it, entails a loss on the breeder and feeder. Yet no one knows better than Professor Brown that, in sight of the Model Farm, are plenty of farmers making money every year by just this ruinous process. Nay, no one would more earnestly than Professor Brown urge his brother agriculturists to go on ruining themselves by the same process. The meaning of this proposition is, first that everything consumed by the animal from its birth being charged—not at the cost of raising, but—at market rates, will amount to the sum mentioned. The profit on the feed is represented in beef—the market being found on the farm instead of, it may

be, miles away—and all costs of marketing are saved, while much that would not be marketable in the ordinary sense, is thus consumed at an actual profit. But this does not explain the whole difference. Professor Brown goes on in the words quoted previously, to show that the value of the manure produced by a beast at the age named is just \$69.50.

In other words, putting the money value named by Mr. Brown on the manure, and against the apparent loss, the beast is sold for exactly what it cost; but all the food it has consumed has paid the farmer a handsome profit. Mr. Brown's estimate may startle some persons, the expenditure and receipts being put at high figures. But first-class farming, first-class stock, and first-class prices, are not uncommonly found in company, and six cents per lb. is not at all too high a price to put on good grade steers of such weight and quality as Mr. Brown has in view, with the facilities for shipment he is locally familiar with. Professor Brown's crop estimates will be noticed under another head. Meantime it may be well to observe what results he claims under a system of operations in which the raising of stock is a prominent ingredient. He makes a profit after distributing the cost of manure and other general charges over a seven years' rotation, and allowing average market prices on crops raised under that system (but not including rental or interest) as follows :—

Mangolds or Turnips	\$34 80	per acre.
Wheat with the Straw	26 90	"
Oats with the Straw	11 72	"
Barley with the Straw	9 70	"
Hay	10 00	"
Peas and Pea Straw	17 25	"
Carrots	49 14	"
Potatoes	28 39	"

or an average on the above crops, raised on one acre, of nearly \$26 per acre of profit. The manure on the one hand is all charged to the crops, while the crops yielding straw are credited with the value of the straw. This again explains much that is apparently paradoxical in the original statement. Farmers as a rule reckon neither straw, for fodder, nor the manure worth anything, and mentally balance one off against the other. Mr. Brown takes notice of both in his account. It may be remarked, here, that Professor Brown does not claim to raise heavier crops than, by really good management, many farmers throughout the Province are found to obtain under the respective heads, while in some cases, both as to yield and market rates, he takes a low average.

There is another point in Professor Brown's evidence which may be noticed here in connection with the subject of feeding—the importance, in an economical sense, of bringing cattle up to a marketable size in the shortest possible period of time. He says :—

“With reference to the beefing of animals, it is to be noted that, the older an animal becomes, the less percentage of increase it shows to its original weight and the amount of food it consumes, so that I hold that it does not pay to keep animals of this kind longer than three years, if they have been well done for all along.

“As an example of this, I may state that five cattle when twenty-two months old weighed 1,102 pounds each, and the most that can be obtained for them at that age is four cents a pound, or \$44. At twenty-nine months old they averaged 1,477, and they will bring at that age six cents a pound, or \$88. If these cattle had been kept for seven months longer they would have increased to 1,717 lbs., and yet we would get no more money per pound for them, unless they were extraordinary beasts, or fattened up for exhibition.

“But we are speaking now of marketable animals, and such an animal would bring an average of only \$103, or 16 per cent. of increase, as against 31½ per cent. in the first case. The question here is, did it pay to sell at twenty-nine months or at thirty-six months? The animal at twenty-nine months fetched \$88, and cost \$147, leaving an apparent loss of \$59, while the animal at thirty-six months fetched \$103, and cost \$184, leaving an apparent loss of \$81, showing a difference of something over four per cent. in favour of the younger animal. I feel quite certain that the sooner we can get rid of our beefing animals the better.”

Experience shows, as put very forcibly by Mr. Armstrong, of Eramosa, and some others, there is no difficulty in bringing a well bred animal up to from 1,400 to 1,500 lbs. at 2½ years. In feeding them the farmer must look not at one but at all his operations. He will then find the result of keeping a full number of good stock to be:—

1. A steady increase in value of his farm.
2. Increased profits on all crops raised for market, as wheat, etc.
3. A consumption on the spot for everything constituting cattle feed at market rates as well as for unmarketable stuff.

The Cattle Shipping Trade.

It may not be improper here to make some further allusion to the British market for cattle already noticed several times incidentally.

What sort of cattle are wanted has been pretty well shown by Mr. Hall and others, in evidence already quoted.

Prime grade steers or heifers of from 1,500 to 1,600 lbs. live weight, are what the buyers on the other side need. Mr. Hall says:—

“I would advise Canadian breeders to send to England none but good animals; they will keep themselves together best. When I have bought bullocks with good flanks and loins, particularly good flanks, and they have travelled from Liverpool up to London I have found that they looked well; but if I happened to buy a stalky animal and got it to the other end of its journey I hardly knew it. I think there is no bullock that sells better than one of 800 pounds, dressed weight—I can tell you nothing about live weight. Bullocks from nine score a quarter to eleven score a quarter are the most saleable in Liverpool; a bullock of from nine to ten in Manchester. In Wakefield you cannot have them too big if they

are good. The weight preferred in London is 100 stone, or ranging from 95 stone to 105. 100 stone may be reckoned ten score a quarter. In London eight pounds go to the stone; they quote there by the stone. The weights that would be the most acceptable would be those of cattle which weigh alive on this continent from 1,350 to 1,500 pounds."

Both Mr. Hall and Mr. Thompson ascribe to the American cattle on the whole a better quality than the Canadian, but, when asked whether a well-bred Canadian stall-fed animal is not equal to anything he had obtained from the States, Mr. Hall replies emphatically in the affirmative, and says:—"I am sure the prospect of the Canadian trade is good in England, and that trade is going to increase each year." Mr. Thompson, whose evidence taken by itself and without a little examination, reads somewhat lugubriously, says, nevertheless, "My advice to farmers is, to go on increasing the amount of well-bred stock," advice he would hardly give unless he were to see some good chance of such stock finding a profitable market. As to the kind of beast wanted, he says:—

"As a rule, I would recommend for shipment to England cattle which are as near thoroughbred as possible. A cross between a thoroughbred Shorthorn and a well-selected native cow would be a very good one. I agree with Mr. Britton as to the necessity of using Shorthorns. I have shipped all breeds, but I find that an animal which combines flesh with fat is the best for the English market. You may take a middling grade steer which is rather rough, and though he may have six inches of fat on his ribs, he will not sell so well as a nice, fat, well-proportioned thoroughbred. We have a great many grade cattle of good shape and sufficient breeding, which would command the highest price in England if they were only kept to a proper age. Farmers turn off their steers at two and a half or three years old, and though their flesh is nice and tender, they are too young to stand the voyage; you would not know them when they reached Liverpool."

It may be doubted whether any considerable number of cattle from two and a half to three years old have been shipped to Great Britain. The method of feeding and general management of the animal has probably more to do than age in fitting it for the voyage. A sufficient quantity of solid food, even if the beast be grass-fed, and if stall-fed, enough exercise to keep it in good condition and enable it to bear the fatigues of the journey, are also insisted upon by the witnesses. Quality in the animal itself, liberal feeding and good management, will, if we believe so perfectly independent and unprejudiced a witness as Mr. Hall, enable us to hold our own and secure a reputation for our cattle second to none. But these conditions are indispensable. At the present time the embargo on American cattle which compels the owners to slaughter them within fourteen days of landing, and prevents them altogether from being carried inland, gives to Canadian cattle a very considerable advantage. Mr. Hall does not believe this embargo will be removed, but he admits that, gradually, the means of transporting dead meat are improving in Great Britain. Mr. Hall says on this point:—

"The American cattle killed at Liverpool and Birkenhead have grown in favour a good deal in many parts of the country, because of the railway companies having made better arrangements for the rapid and successful conveyance of

meat. In that way Canadians have been losing a little of the advantage which was given them by the obligation to slaughter American cattle at Liverpool. There has not been so much change in that respect in Wakefield or Liverpool; but from Manchester we have not so many buyers as we used to have. Some of them say now, 'There is so much difference in the price that we will go down to Liverpool and buy some Liverpool or Birkenhead-killed American beef.'"

Accidental advantages of this kind are acceptable so long as they endure, but it is on sound principles of breeding, feeding and managing their business Canadian farmers must depend for success.

In the evidence of Messrs. John and Robt. Black, of Fergus, the experience of those gentlemen in connection with some experimental shipments of cattle to Belgium and France by Mr. John Black, are related. They appear, on the whole, to have been attended with tolerably encouraging results, but the value of such a trade, if carried on to any large extent, has yet to be ascertained.

SHEEP FARMING.

The special advantages of sheep farming are thus tersely summed up by Professor Brown :—

- Fewer risks by death ;
- Two crops per annum ;
- Consolidating and manuring light soils ;
- Rich manure at all times ;
- More easily kept on poor pastures ;
- Less cost in buildings and winter management ;
- Greater returns for money invested.

The limited size of the farms, the absence of any large area adapted for sheep runs, and the necessity for providing fodder for six months in the year, during which the sheep are in the yards, have all tended to discourage sheep farming on a large scale in Ontario. But Ontario is, on the other hand, a country confessedly well adapted to the raising of sheep. The dryness of the atmosphere preserves them from the diseases to which they are most subject, and if such complaints as the rot have ever been known, it has either been in the case, of a new importation, or the result of some scandalous negligence. It may be broadly stated that, in Ontario, sheep are subject to no epidemics, nor, as a rule, to any fatal form of disease. And that Ontario is a most favourable breeding ground for sheep is proved, from the frequent reference in the evidence to the United States as a market for our thoroughbred sheep needed to improve their flocks, and which cannot be advantageously raised on the other side of the border line. The very nature of the sheep as a wool-bearing animal is an ever-present contradiction to the notion that this climate can be too severe for it. The fact is, that a sheep in Ontario moderately well cared for in winter, is far less exposed to atmospheric risks than in England, where it is subjected to a chilly dampness that its fleecy covering absorbs and cannot resist, or where it is often folded in

open fields, leg deep in mud. The breeds of sheep noticed in the course of the inquiry have been the Cotswold, Leicester, Lincoln, Shropshire, Hampshire, and Southdown, and—in one or two instances—the Merino. The demand abroad for the long, coarse wools, in which a large export trade has been done, while the tweeds and other goods chiefly manufactured in Canada required a wool not profitably grown in this country, was for a long period a strong inducement to the Ontario farmer to cultivate the long-woolled varieties. For mutton, they supplied a large carcase, and mutton was mutton to many people, no matter whether its quality, from an epicure's point of view, was first-class or not. Even to-day, in spite of the unquestioned preference of the British buyer for Down mutton of a moderate size, people are to be found who argue that, because the steamship companies charge for sheep at per head, it is better to raise and feed large sheep. In this, however, as in everything else, the demand must ultimately settle the question of production or supply, and it will be the object of the Commissioners to indicate what—according to a fair view of the whole evidence—is the true policy of the Ontario farmer in respect of sheep-raising at this moment.

The sheep trade of Canada, outside the domestic demand, assumes three distinct forms: First, there is the trade in thoroughbred long-woolled sheep with the States; secondly, there is a large trade, mostly in lambs, for butchering purposes, with the States; and lastly, there is the shipping trade in mutton sheep for the British market. Then, for wool, there is for the coarse wools a large demand always from abroad, and a limited demand for local purposes at home, and, recently, an active demand both for home purposes and export for a medium wool, partaking largely of the Down-wool character, and bringing a higher price than the long-wools. The evidence on these respective topics will now be noticed in due order.

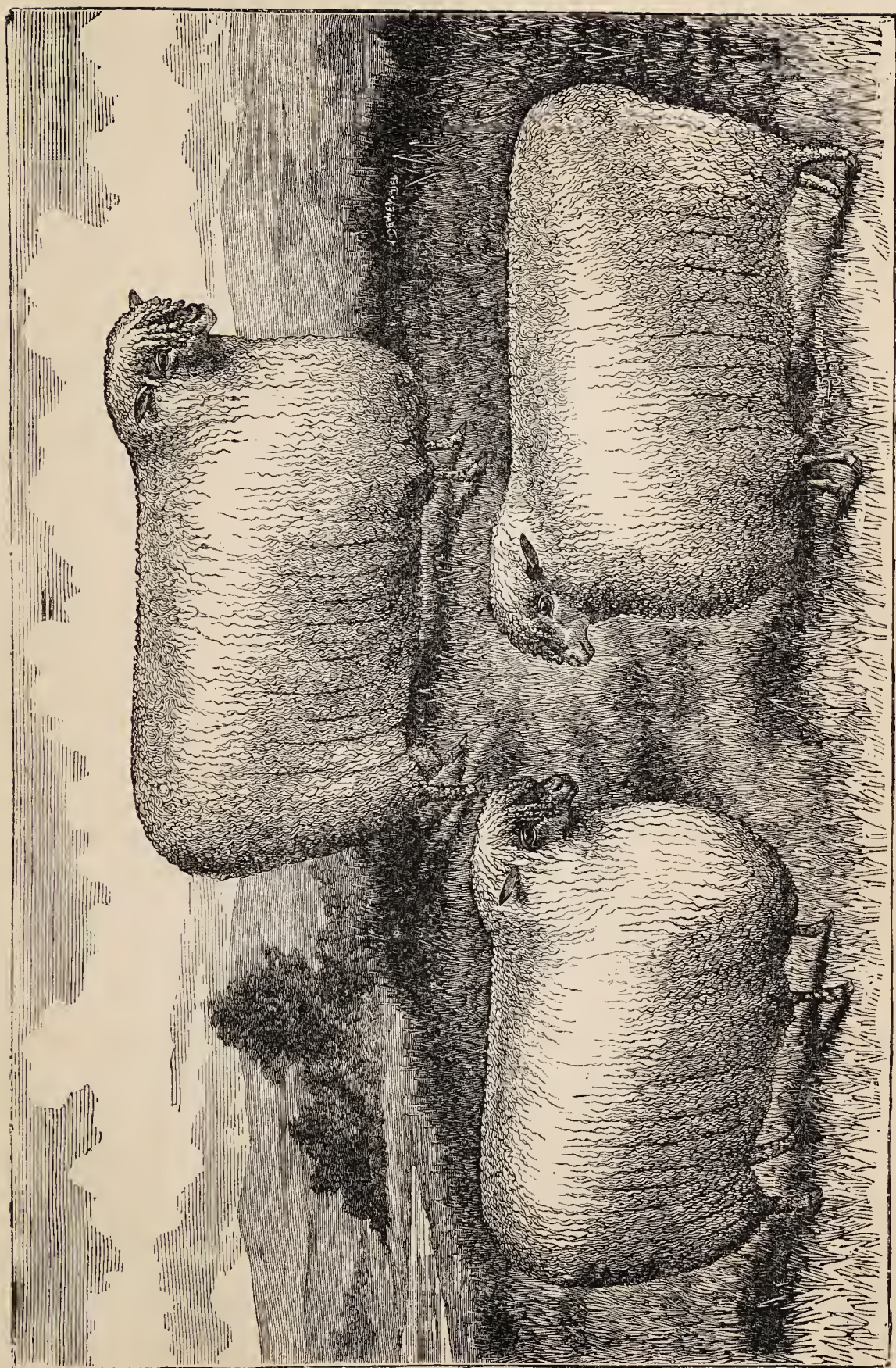
Foreign Demand for Thoroughbred Sheep.

First, as to the American trade in breeding sheep, Mr. Russell, of Richmond Hill, County of York, says:—

“I have been breeding Cotswolds since they first came into Canada, and have taken prizes at the principal shows in Canada for Leicesters, Lincolns, and Cotswolds; but a few years ago I sold off all but the Cotswolds, finding they had better constitutions, and were the most profitable. My principal market is the United States. Last year I sent fifty to the States. In 1875 I sold all my yearling rams, eight of them at an average of \$105 a head. I have sold ewes of my own raising at \$300 per pair.”

He adds as follows:—

“A number of Cotswold breeders have been springing up in various parts of the United States, but, judging from their success, I am of opinion that the best stock rams for the American continent will be raised along the north shore of



Woolly Wools.

Lake Ontario. I do not believe that there is as suitable a soil and climate south of the lake. I do not think the Leicester wool has more lustre than the Cotswold. Of course Cotswold breeders could very soon improve the quality of their fleeces, but the American trade principally demands weight of fleece more than quality, and the profit to the breeder is to raise what is wanted."

Mr. Snell, of Edmonton (Peel), whose fine sheep have their representatives in the group represented in the accompanying illustration, says:—

"The United States has hitherto been our best market for Cotswold sheep. The Kentuckians have been our best customers, and they are very particular about the quality of the wool, making that a specialty, and we have been trying to breed our sheep to suit the taste of that market; and I am satisfied that, in the last ten years, we have made a marked improvement in the quality of the wool. There is a difference in the quality of the wool in different parts of the same sheep. There is a tendency to grosser wool on the thighs. I consider that objectionable. The first place where our Kentucky customers catch hold of a sheep is the thigh, and if they find pretty good wool there they judge that it is good all over the body. . . . We also supply Cotswolds for the Western States—Missouri, Iowa, Illinois, as well as Kentucky."

Mr. F. W. Stone, of Guelph, says:—

"I am a large breeder of sheep. I keep Cotswolds and Southdowns at present; at one time I also had Leicesters. I just keep them for breeding purposes. Our best market for sheep is in the United States. We used to sell every year by auction. Canadian farmers bought pretty largely; they went better into sheep than into cattle."

Messrs. Watt, of Salem (Wellington), also breed Cotswolds, and, while finding a good demand at home, also ship them for breeding purposes to Colorado and Illinois.

Mr. Parkinson, of Eramosa, is a breeder of Leicesters. He sells largely to farmers in the Dominion, but exports breeding sheep to Oregon, Washington Territory, California, Michigan, Illinois, Ohio and New York.

Mr. Douglass, of Percy Township (Northumberland), breeds Leicesters and Cotswolds, "and those he does not use for breeding are exported."

Mr. Rennelson, of Galt, says:—

"The buyers generally come from the States, and a great many of the American buyers prefer Cotswolds. I think there is a fair profit in turning out Southdown shearling rams at \$25 a head. My reason for turning my attention more particularly to the Southdown lately is that there seems to be a growing demand for that class of sheep. I think there is a tendency in the direction of a falling off in the demand for Cotswolds in the States. I have been assured by American buyers that there will shortly be a large demand in their country for Downs for the purpose of crossing on the long-wools they have been importing."

This evidence is sufficient to show that there is a constant and active demand for both thoroughbred Cotswolds and Leicesters for breeding purposes in the States, with a prospect of the thoroughbred Southdown being also in request.

Foreign Trade in Lambs.

The trade in lambs with the States fluctuates considerably, although always a large one. Whether it is on the whole profitable is another matter. Several witnesses gave evidence in regard to this branch of industry.

Mr. James Donald, of Dalhousie (Lanark), says:—

“I buy sheep for the American market. Any fat sheep or lambs suit that demand. The Americans will take all we can send. I sent between 9,000 and 10,000 myself last year, and I expect to send 11,000 this year. I ship to Boston and New York and elsewhere. I give from \$3 to \$7, or more. It depends on the weight. Anything fat will suit. We should prefer well-bred sheep if we could get them. Our purchases extend over portions of the counties of Lanark, Renfrew and Carleton.

“We usually begin to ship in September, and continue in October, November, and December, up to Christmas. The farmers are beginning to alter the lambs. There are several other shippers besides myself. The firm I was connected with shipped 32,000 head last year. The buyers would give a cent a pound more for a selected shipment of wether or ewe lambs than for ram lambs.”

The range of prices, it will be observed, is very wide—from \$3 to \$7 per head—and the profitableness of the trade or otherwise may depend altogether on the question whether the maximum or the minimum is most often reached.

Mr. Rawlings, of Forest (Lambton), says:—

“There is some trade going on between our part of the country and the United States in lambs. Just now there is no money in that trade, but we are in hopes that as the weather becomes colder the trade will get a little better. It would be more profitable for farmers not to sell their lambs, but to keep them until they are yearlings, and then send them to Europe.”

Mr. Simmons, of Lobo (Middlesex), remarks:—

“Our farmers are making a great mistake in selling so many of their lambs. They should keep most of them until they are two years old. The wool, if they were properly kept, would be worth close upon \$5 for the two years, and if they were wethers, they would bring perhaps about \$7, so selling the lambs at \$3 is a great loss to the farmer.”

Mr. Hood, of Guelph, also expresses his opinion that the trade in lambs is undesirable, and that farmers would find it more profitable to keep them until matured, realizing thereby a larger price for the sheep, and also the value of the wool.

Mr. Parkinson, of Eramosa (Wellington), is pointing at the same practice when he says:—

“If an ordinary farmer made preparations, he could afford to keep his lambs longer than the fall. A great many farmers sell all their coarse grains, and then they have to sell their lambs, and they will be compelled to do it so long as they continue the same system. If they would keep their coarse grains and turnips on the farm, and feed them to their stock, they would not only gain by their stock, but in the manure which they would have to keep up the fertility of the soil.”

Mr. Stephen White, of Charing Cross (Kent), seems to entertain a very similar opinion to Mr. Parkinson. He says:—

“Some of our farmers sell their lambs in the fall; others keep them over. We get for lambs from \$2.50 to \$3. We would get \$6 for them when they are two years old, and, of course, we have to take into account the wool we get, as well as the expense of keeping them. I think when a farmer has good-sized sheep of the right kind it would pay him to keep them until they are two years old. A good many lambs are sent to the United States, but most of the sheep are sent to England. Buyers cull out the best for the old country, the culls being sent to the United States, or, if very bad, sold here.”

The actual difference between the sum realized for a mature sheep, after it has yielded one or two clips of wool,—minus cost of its maintenance,—and the sum it fetches as a lamb in the fall, or early winter of the first year of its life, may be a matter of some debate, and will be considered presently.

Trade with Great Britain.

In this, as in many other branches of farming industry, the opening of the trade with Great Britain has put a new complexion altogether on the business of sheep-raising. In the first place the taste of people there is fastidious, and to command paying prices, the mutton must be first-class in quality. To show the rapidity with which this trade has grown, it is only necessary to quote the published returns of the export of sheep from Canada (or, practically, from Ontario) to Great Britain:—

1876.....	none
1877.....	3,170
1878.....	11,985
1879.....	54,721
1880.....	109,506

The trade and navigation returns are made up to the 30th June in each year. This is a trade worth cultivating, but as yet too little attention has been paid by breeders to its requirements if it is to be profitably maintained.

Mr. Hall, of Liverpool, says on this point:—

“Large numbers of Canadian sheep pass through my hands. They do not rank well in the English market. The reason is that most of them are rams and ewes, and the ewes as a rule, are old sucked-out animals. Some of them you can get fat, but cannot get them to take on flesh, and the consequence is that they are light on the loins, and mutton of that sort does not sell well.”

The fact is that farmers have not had too many sheep to sell, their lambs have been shipped to the States, and those that remained have been taken largely from just the classes Mr. Hall describes. One effect of the lamb trade has been to

induce farmers to neglect "altering" their ram lambs. The effect of this on the reputation of Canadian sheep in England is most detrimental.

Mr. Hall says :—

"A thing that you ought to implore of your farmers to do, is to send the rams as wethers. Buyers come to market and look at lots of sheep, and when they find that there are no wethers in them they walk away. For the ordinary family butcher, wethers are indispensable—wethers or gimmers, that is ewes that have had no lambs."

And once more he returns to the subject :—

"Then let the animals you send be wethers or gimmers in all cases. If you sent over a mixed shipload of sheep and at the same time sent a thousand well selected wethers, there would be, I think, a difference of 10 shillings (\$2.50) a head in favour of the wethers, and you would have twenty buyers for them where you would have one for the others—you would have all the select buyers after the wethers."

Other shippers urge the same point just as strongly. Mr. Britton says :—

"We send wethers and ewes—all kinds—to England, but the farmers make a mistake in not making wethers of their rams before they are too old. There is two cents difference in the price of a young ram and a wether of the same age. When they are five months old they begin to run around after the ewes and their flesh becomes coarser and tougher. The difference in taste can be noticed in the month of September. The sooner they are castrated the better; it should be done while they are young. For ordinary sheep I am now paying 3½c. to 5c.; wethers bring 4¼c. to 5c. Lots are usually bought of different kinds together—say one ram in ten. The sheep are about two years old when they are shipped to Europe. When I say that wethers bring two cents per pound more than rams, I mean that I would pay that much higher rate for 100 wethers than for 100 rams."

Pointing very forcibly to the competition the Canadian shipper always has to face from the other side of the boundary line, Mr. Thompson says :—

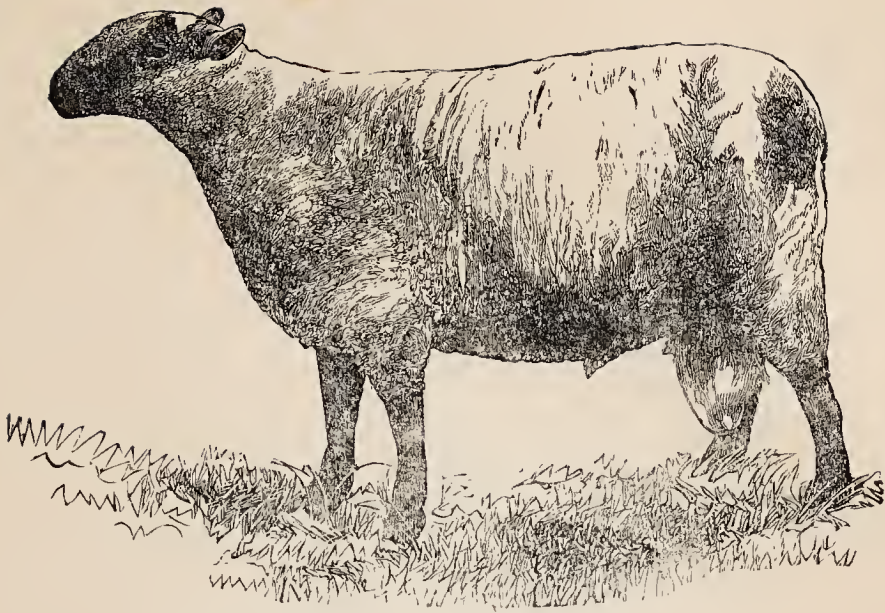
"The trouble here is, that like our cattle, you cannot make up a large lot without having all sorts. Wethers are worth about one cent per pound more than we pay for sheep now. As the markets are to-day we could not pay 4 cents per lb. even for wethers. I think 6 cents would be about the highest we could pay, unless they were shipped in wool in the spring, and we could get a select lot of wethers, when we might pay 7 cents."

Mr. Simmons makes just the same complaint. He says, as between a ewe and a wether of a given weight, there would, in favour of the wether, be \$1 difference in price, and, if a cargo could be obtained of all wethers, the difference would be a cent a pound more.

Mr. Thos. Govenlock, of Seaforth, a large shipper, says :—

"Mutton brings a little better price than beef in England. There is a preference there for the meat of Southdown sheep. There is a difficulty in getting enough wethers in this country. If the farmers kept more wethers, we should be able to command better prices; but they sell off their lambs too much."

Mr. John Black, of Fergus, who shipped over 2,000 sheep last year to Great Britain, raises the same cry for "more wethers." He says :—



SHEARLING HAMPSHIRE DOWN.



SOUTHDOWNS.

"The sheep shipped were largely ewes—there is a want of wethers. It would, in my opinion, pay farmers to keep their lambs till two years old, and furnish a supply of wethers. . . . For a shipload of wethers of the class mentioned I could give a cent a pound more than for the ordinary shipments I have made. I think there are good prospects for a market for sheep in England."

Mr. John Donald, already referred to as a large buyer of lambs for export to the States, says:—

"A great loss accrues owing to the farmers not making wethers of their lambs. I should say the three counties lose over \$10,000 a year by this means."

Mr. Albin Rawlings is equally earnest on this point. He says:—

"It would be a great boon to the country to get our farmers to castrate their lambs. I think Ontario is losing half a dollar a head on every buck lamb they ship to Europe or the United States. They have not a back on them, and in fact they are nearly unsaleable in some seasons of the year, and they are scarcely fit for table use. In buying lambs I would prefer to have the tails cut off and have them altered. As long as the ewe has not been used for breeding purposes I don't object to it at all. If the ewe has had lambs she is about a cent a pound less valuable."

To command the British market, then, it may as well be understood, once for all, that farmers must make wethers of their rams and ship either wethers, or what Mr. Hall calls "gimmers," ewes that have never been with lamb. Formerly, sheep were regarded as in good marketable condition at four years, but now early maturity is a desideratum. Mr. Hall says on this point:—

"In England in my early days the better class of people all wanted four-year-old mutton. There is no such thing to be had in quantity now-a-days; it is all early maturity. There are lots of young sheep sold in the London and Liverpool market, one year and a few months old, at from three pounds to three pound ten per head."

Most of the witnesses seem to indicate two years as about the age at which it is desirable sheep should be shipped to Europe. Professor Brown says:—"For flesh it is most profitable to sell sheep in April and May, and all should be off when eighteen months old." Looking, then, to early maturity as the next quality to be secured, the question is, in what breed, or by the agency of what breed can it best be obtained?

Early Maturity.

Of the Southdown, Mr. Stephen White says:—

"The lambs mature earlier than those of the larger breeds."

Mr. Jno. Motherwell, of Bathurst (Lanark), is going to cross his sheep with the Southdown "to secure early maturity."

Mr. Stone, of Guelph, says:—

"As to early maturity, a great deal depends on how you feed your sheep. We do not have much disease among sheep in this country. We have had the least trouble with the Southdowns; we have not paid, or required to pay, that

attention to them that we did to the others. I think the Southdowns are the best nurses."

Mr. McCrae, of Guelph, says: "The Southdown beats all the other breeds in early maturity. At a year old I think the Southdown would attain 150 lbs."

Mr. Parkinson, on the other hand, says:—

"The Cotswolds also require a longer time to come to maturity, and they will not be so finished at the end of a year or a year and a half as the Leicesters. The Leicesters are ready to kill at any age. A third-cross Leicester wether should be got at a good weight for the European market at a year and a half old; at a year old I think it should weigh 140 to 150 pounds. Of course that is when the wool is on. Two years ago I had four wether lambs—grades pretty well bred—that I bought. Sometime in the month of February I sold these lambs, along with six ewe lambs, for \$74; that is, I got \$8.00 apiece for the wether lambs, and \$7.00 a piece for the ewes. They were about eleven months old."

Mr. Snell gives credit to the Leicester as an early maturing sheep.

Mr. Morgan, of Oshawa, who gives evidence as a buyer and shipper, approves the Down sheep for early maturity as against the Cotswold.

Mr. Simmons, however, says:—"As to breeds which attain maturity earliest, *the Leicesters come first, the Lincolns next*, and the Cotswolds third. We have very few Southdowns."

Professor Brown says:—"For weight in the shortest time the Leicester is ahead in our experience. . . . In early maturing the order is:—Leicester, Southdown, Southdown cross, Leicester cross, Oxford Down cross, and the slowest is the Cotswold." Having regard to the precision with which Professor Brown's experiments are likely to be conducted, as well as the previous evidence *pro* and *con*, to the Leicesters must be awarded the first place for early maturity, although not to so great an extent as to prejudice the Downs, if in other respects they are found most desirable for shipping purposes.

Preference for Down Mutton.

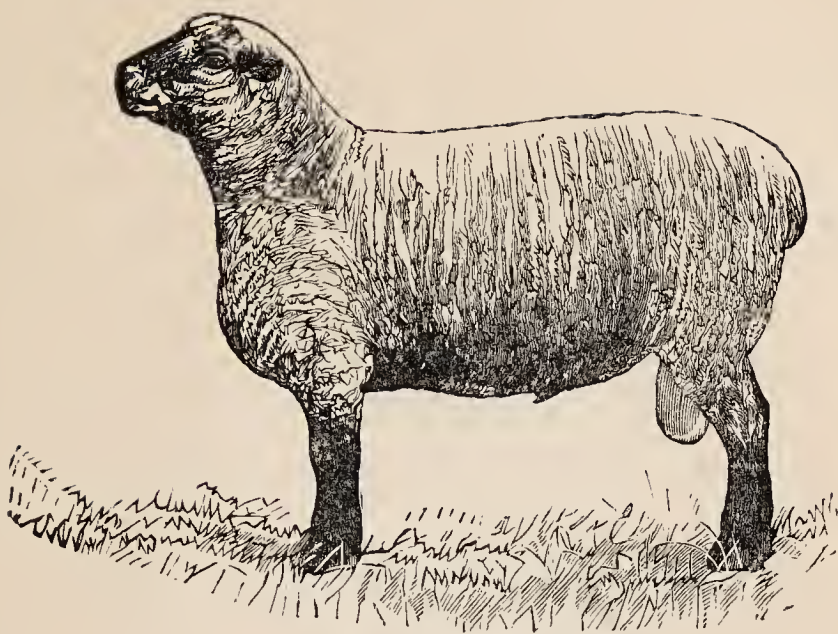
The strong popular preference for Down mutton in England has also to be considered. So strong is it that, says Mr. Hall:—

"Buyers of sheep for the purpose of mutton do not calculate on the wool at all; they look at the face of the animal, and if they see some gray or black there they like that. In lambs also they do not like the white-faced; they want them with the strain of the Down in them. Butchers sometimes leave the skin on the legs of the carcasses of sheep in order to show what they are, because if they have Down in them they are worth so much more a pound."

Mr. Britton adds on this point:—

"In England the wool brings about the same price as here; the quality of the meat is the first consideration. A first-class butcher in England would not sell anything else but mutton from black-faced sheep to his customers."

It is sometimes suggested that the Southdowns are too small for profitable



SHEARLING OXFORD DOWN.



OXFORD DOWNS.

mutton sheep, and the use of the Shropshire or Hampshire Down is recommended; but it is not a large sheep that is needed in the English market. Mr. Morgan says:—

“The Southdown sheep is the finest of the Downs. When dressed it weighs as high as 80 or 90 pounds; about 80 pounds is the popular weight.”

Mr. Britton says:—“Sheep dressing from 70 lbs. to 75 lbs. are the best class for the English market.”

Mr. Hall says:—“The weight of sheep preferred for mutton varies from 60 lbs. to 90 lbs., according to the class of customers. From 70 to 80 lbs. is a capital weight to get.”

Mr. Thompson is favourable to the Oxford or Shropshire breed, but says:—“The best sheep we have in Canada are the Southdowns, and a cross between them and the Cotswolds, or Leicesters—they bring the best prices.”

Mr. Britton says:—

“I would prefer as a cross Oxford rams with Cotswolds or Leicesters. That cross makes first-class mutton, and the fleece would be very good—the wool is soft and fine. They weigh about 20 lbs. to the quarter, but they are full of lean meat. That weight would not be objectionable in the English market. If there is plenty of lean meat they do not object to an animal dressing 100 lbs. There is not much difference in the meat of the Leicesters and Cotswolds. Such a cross as I have mentioned would stand our climate, and they gain flesh rapidly. The cross would be a black-faced sheep. There is no doubt that a male thoroughbred conveys its characteristics better than a thoroughbred female.”

Mr. Hall says:—

“A few years ago a Mr. Aungier, of the firm of P. Leonard & Co., had a lot of Shropshire Downs from Ireland and a lot of Lincolns in the market the same morning. The Shropshire Downs did not weigh so heavy as the Lincolns by five pounds a quarter. There were a dozen people there early to buy the Shropshires, but, in the afternoon, although he begged and implored people to take the Lincolns for ten shillings less than he sold the Shropshires for, they would not buy them. I do not think there is any animal so serviceable as the Shropshire. The Shropshire would cross wonderfully well with your Leicester. I object to the Leicester as a mutton yielding sheep; but the cross improves it, because the Leicester is a sheep of very nearly the same type as the Cotswold. If you were to use the Shropshire ram for crossing with Leicesters or good grade sheep, that would produce just the mutton we want.”

Mr. Hall also refers to the Merinos. He says:—

“We are getting large numbers of sheep from the United States. They are sending us from that country a very fine class of Merinos and some others, but principally Merinos. I have seen some of them weighing 90 and 100 pounds. They are very ripe and full of fat. They are not profitable meat for the butchers being too full of fat, and they are short of flesh. Canadians rank well with the Americans in regard to their capacity for sending to England a good class of sheep, but they do not rank with them in regard to sending wethers. The Shropshire Down is a particularly hardy sheep. If you cross the Shropshire with the Leicester you get a very popular wool.”

Starting, then, with the principle, recognized by everyone whose opinion is

worth having, that the foundation for a profitable trade must be secured by the use of thoroughbred male animals alone, whether sheep or cattle are in question the points particularly to be obtained in a sheep for the British market, are—first—it must be a wether, or ewe never used for breeding; secondly—it must be an animal that will mature early; thirdly—it must have the Down stamp upon it—black face and black legs; and—fourth—it should be of about 140 to 160 pounds live weight. It is almost unnecessary to say that it must be in good condition, for the farmer who studies the wants of his customers, so far as the several matters above mentioned are concerned, will not be likely to neglect so essential a particular as feeding carefully and liberally. “We want,” says Mr. Hall, “mutton that is lean—plenty of flesh—juicy mutton, ripe and lean,” and then he gives his test of the sheep he handles in such numbers. He says:—

“In examining a sheep most people touch him by spreading the hand across the loins; but I choose them by touching them with the ends of the fingers in the middle of the loins, and I can then tell in a moment whether there is flesh there or not.”

The Down stamp or type being the one to be chiefly cultivated for the British market, does not of course involve the sale to the shipper of either pure-bred Downs or of crosses exclusively between Down breeds. All that is needed is that the Down characteristics should be predominant. Of the three varieties of Down, the Southdown is the smallest. The Oxford is a breed of only some thirty-five years' standing, obtained originally by crossing a Hampshire Down ewe with a Cotswold ram, and then the issue of that cross with a Southdown ram—the “topping off” with the Southdown being particularly attended to. How far the Oxford Downs may possess the merit of prepotency is not very clearly brought out in the evidence, the fact being that the Oxfords are little known in Canada. Mr. Clay, of Bow Park, whose acquaintance with the Oxfords is that of an English as well as a Canadian farmer, gives the Oxfords on the whole the preference, agreeing at the same time with the other witnesses as to the size and character of the sheep required for the English trade. He seems to be confident, too, of the transmitting power of the Oxford. He says:—

“The Oxford is not a pure-bred sheep to begin with, but it has been bred so consistently that it now gets the name of being a pure-bred sheep, and the best proof that it is so is, that it is used to cross upon animals that are not pure-bred, so as to improve them. The great objection to the Southdown is its want of wool. It is an important item to raise a considerable fleece of wool in this country, and the Oxford Down has the fullest fleece of all the Downs.”

Mr. Benson, although not speaking very confidently, leans to the use of the Oxford or Hampshire Down in order to obtain size.

Mr. Rennelson, of Galt, has found a cross of the Southdown and the Leicester, or Cotswold successful. He says:—

“I have crossed Leicesters with the Southdowns, and the result has been excellent. By that course I have obtained a greater weight than in the South-

downs. I have thus obtained almost as heavy sheep as the Leicesters. I think, however, that the Southdown crosses better on the Cotswold than on the Leicester; this cross gives more wool, and I do not see but they are equally as good in other respects. The sheep are more apt to be bare of wool when the cross is with the Leicester; but by crossing with the Cotswold we get a larger sheep and more wool, about as much wool as from ordinary long-woolled sheep."

Mr. Andrew Elliott, of Galt, whose object is chiefly to raise mutton, gives the preference to the Southdown. He has had no difficulty in getting lambs in December to 100 lbs., and sheep in April to 168 lbs. from crosses of the Southdown on the Leicester.

Mr. Peter Clark, of Montague (Lanark), has found the use of a pure-bred Southdown ram on native sheep very successful.

Mr. Robert L. Macfarlane, of Ramsay (Lanark), says:—

"I keep a flock of about 30 sheep or more, nearly pure Leicesters. The first improvement we made, over thirty years ago, was from the Southdown. No other cross did so well, but other breeds became popular, and the Southdown blood was got rid off."

Mr. Stone says:—

"The Southdown is a valuable sheep, and easily kept. A valuable sheep for the old country market would be a cross of a Southdown ram upon a grade or Leicester ewe; but I believe that somebody should always keep pure-bred sheep. Cotswolds, Southdowns, Leicesters, and Lincolns are all very valuable sheep; Shropshire and Oxford Downs are only crosses."

Mr. McCrae, of Guelph, is favourable to the Cotswold as the best sheep on the whole for improving the common stock of the country, but in regard to sheep for exportation he says:—

"I think the Southdown is a very acceptable sheep for crossing with the common stock of the country in order to obtain an animal for exportation; you will get the best wethers from a cross of the Southdown with the native stock. The Southdown beats all the other breeds in early maturity. At a year old I think the Southdown would attain one hundred and fifty pounds. I don't think the Oxford Down would be a favourable sheep to cross with the common stock of the country. By using a Cotswold or a Leicester ram I think we could obtain a better animal for exportation than by using the Oxford Down. I think it decidedly desirable that the breeds should be kept distinct; I would not approve of the practice of using a Cotswold one year, a Leicester the next year and a Southdown the next year."

Mr. Hood, of Guelph, thus narrates the result of his observations:—

"The Southdown or a cross-bred Southdown will fetch more money on the English market than the Cotswold. There is no doubt that the Southdown makes the finest mutton, although you don't get so heavy a carcass from it as you do from the Cotswold, as they are generally shipped by the head. There would be more profit by crossing with an Oxford or a Leicester or a Shropshire; I like the Oxford. When I was in London wandering through the parks of the west end, I noticed that the sheep grazing in them were invariably half-breeds, crossed with some of the Downs. I asked if they all belonged to one party, and I was told no, that they belonged to the different butchers who supplied the aris-

tocracy in the west end of London, and that they had these sheep on exhibition, so that the people driving through the parks in their carriages could see them; and each butcher prides himself on having his particular brand there, whether it is Oxford or Southdown—but they are nearly always crossed breeds—the Southdown crossed with the Oxford or the Leicester. The sheep were not clipped, as I saw them in the end of May. I am very certain that they would weigh more than twenty pounds to the quarter. A cross of a grade ewe with a Leicester ram, if shipped at fifteen months old, and weighing twenty-two and a half pounds to the quarter, would not bring so high a price as a dark-faced sheep; there is a penny or a penny half-penny difference in the price, if you get a sheep of medium weight and quality. When you take one of these well-fatted long-woolled sheep to the London market, you cannot sell it for mutton, because it is simply a lot of tallow. It might weigh about 130 pounds of mutton, but the mutton is not saleable. The Leicester and Cotswold sheep are wanted for crossing purposes; I myself would rather take the Leicester, because I consider it has a better constitution than the Cotswold."

Mr. Anderson, of Puslinch (Wellington), says :—

"I think the cross of a Southdown ram on a grade Leicester ewe would be better than a cross with Oxford Down rams. The first cross is always the best. The cross of a Southdown ram on a grade Leicester or Cotswold ewe would weigh, at two years old, 80 to 100 pounds; and if you fed them with grain from the time they were lambed they would go up to 150 or 160 pounds. It is only very recently since the better class of wool has got into greater demand. The butchers decidedly prefer Southdown mutton to any other, and they want the first cross if they can get it; I don't know whether they charge their customers any more for that class of mutton, but I don't think they do. I have exhibited a good many sheep, and several times I have taken the first prize at the Provincial shows for lambs."

Mr. Britton would prefer the Oxford as the sheep to cross with Cotswolds or Leicesters for market, but does not think the Southdown cross would be too small.

Mr. Thompson says :—"If we were to cross the Southdowns with the Cotswolds or Leicesters we would have a hardy sheep, quite large enough."

Mr. Geary, of London, approves of crossing Leicesters or Lincolns with the Down for the British market, but does not express a preference for either one of the four Down varieties.

Mr. John Black, of Fergus, thinks at the present time the most profitable sheep for wool and mutton combined would be a cross of the Leicester with the Southdown; but that might change with the demand for wool.

Mr. Hall, of Liverpool, who, as already remarked, speaks as a dealer in sheep, not as a breeder, says :—

"Southdowns deteriorate in the north of England, in Scotland and in Ireland. In Ireland they use mostly the Shropshire Down for crossing. The Oxford Down has not been very much used. It is larger than the Shropshire. It would not be too large for our market. With us, if you have quality and size combined, you will find plenty of demand. It would not pay you to send us pure Oxfords, but cross the native sheep here with the Oxfords."

The idea that the Southdowns may be a little too delicate for this climate is

dispelled by experience. The Southdown, as its name implies, is a south country sheep, and, as sheep are kept in England, might very likely suffer from the drizzling rains, cold, damp winds, and clammy mists of the northern portion of the United Kingdom. The hardier Shropshire is very likely a better sheep for these ungenial experiences. But mere cold, with a dry atmosphere, tells for nothing, and no fear need be entertained of the Southdown failing, with ordinary care—the same care that all sheep are entitled to—to stand an Ontario winter as well as the best. The Southdown is much more plentiful in Canada than the other Downs. It is a lively, “chunky,” active sheep, very well adapted for rough lands or a hilly region, but thriving anywhere. Without, therefore, in the least discouraging the use of the Shropshire, Hampshire, or Oxford Downs, where it may be deemed expedient, either from convenience or in order to keep up the size of the flock, to employ them, it is to the Southdown the farmers will probably be induced first to look, so far as the male animal is concerned, to obtain the sheep wanted for shipment to Great Britain. But to get size, and also to obtain the peculiar class of wool most in demand, and respecting which more will be said hereafter, the evidence points very strongly to a cross of the Down on the long-woolled or native sheep. What proportions of any breed may be found in the latter it is impossible to say. The trace of the Down has probably not been altogether lost during the long period Leicesters, Cotswolds and Lincolns have held the field. But it is not difficult to perceive that, in ever varying degrees, the “natives” have been gradually stamped more and more with the long-woolled characteristics. And, while it will be expedient for the careful breeder, in many cases, to keep the Leicester, the Cotswold, or the Lincoln type alive in his flock of ewes, his object should be, if he uses a long-woolled ram, by judicious selection of females approximating most nearly to the Down, to throw the balance in favour of the Down side. The black or gray face, and the black legs are, it must be remembered, a necessity in order to take the fancy of the British buyer. For the American lamb market, a fat lamb of any breed appears to be welcome at some price or other.

WOOLS.

The next question to be considered is that of wool. No one pretends, of course, that the Downs give so heavy a fleece as the long-woolled sheep. As to the clip usually obtained from the various breeds, the witnesses vary much; a great deal depending on general treatment and feeding as well as on individual characteristics. It may be interesting to notice what is said in this respect of each respective breed, not forgetting the “natives.”

The Cotswolds.

Mr. Stone, of Guelph, claims to have been the first in his section of country to introduce the Cotswold sheep. He had, he says, at first a difficulty in inducing anyone to look at them, but by degrees that prejudice vanished, and now no sheep has among its breeders more enthusiastic admirers than the Cotswold. Mr. Stone is a man, however, who looks at everything in a most practical manner, and is no more prejudiced in favour of his Cotswolds than of his beautiful white-faced cattle. As regards wool, he says:—

“We find it difficult to keep up the same quality of wool here as they do in England; our climate is too dry and hot. I fancy that the Southdown would keep up the quality of its wool better than the Cotswold in this country. If the farmers would use a Cotswold ewe with a Shropshire or Southdown buck I think they would have better wool.



COTSWOLDS.

“But now there is not so much demand for wool of the length that there formerly was. With the machinery now in use, wool four or five inches long can be worked as well, provided it has the same texture, as that eight or twelve inches long. I am quite satisfied that if I had a large quantity of wool from a cross of a Southdown on the Cotswold, I could command three or five cents a pound more for it than for the very coarse wool of the other breeds.

“I don't think that cross reduces the quantity very much. I have seen some fleeces in which the wool, though not so long, was thicker. The weight was

pretty nearly the same. The quantity of wool depends very much on the weight of the sheep.

"The tendency of the market is at present towards shorter wool; there is a better demand for Southdown wool now than there has been for some time."

This points to two conclusions. First, that, no matter what the demand for, or increasing popularity of the Downs, the Cotswolds may still, even from a wool dealer's point of view, be bred to advantage; and, secondly, that the present demand for a medium wool very favourably coincides with the requirements of the market for mutton.

Mr. Anderson, of Puslinch, who breeds Southdowns exclusively at the present time, who gave up Leicesters and Cotswolds "because he could make more money out of the Southdowns," and whose evidence implies that, in his opinion, three Southdowns can be kept for the same as one Cotswold, says:—

"Two Cotswolds would produce about eight pounds of wool each—sixteen pounds. The average price of that would be about 28 cents. Three Southdowns at the same age would average four and a half pounds of wool each—thirteen and a half pounds. This would sell at an average of 38 cents. I have never fed my sheep for butchering, but always sold them for breeding purposes, so that I cannot give an estimate of the difference in the value of the mutton of two Cotswolds and three Southdowns. I have never had any first crosses of Southdown rams with Cotswold ewes, but my ram got among my neighbour's Cotswold sheep, and he had some crosses which turned out to be magnificent. The wool from that cross would be the medium wool which sells on the market at about three cents a pound less than pure Southdown wool, and the fleece would weigh from six and a half to seven pounds. Last year 27 cents a pound was obtained for such wool, when long wool was selling for 18 or 20 cents, and when you take into consideration the larger quantity of wool, it makes a vast difference."

So that by an accident, Mr. Anderson proved the correctness of Mr. Stone's judgment as to the value of the cross between these two breeds.

Mr. Watt admits the change in character of the demand for wool, but thinks a Cotswold fleece will bring more than a Southdown. He does not express an opinion as to the result, in this respect, of a combination of the two.

Mr. Parkinson, who breeds Leicesters, says:—

"The great demand for Cotswold sheep has been from the United States. The Cotswold sheep have been much improved lately. What have been imported in recent years are far superior to what were formerly imported. They are better woolled sheep and have finer quality; but from my observation of the Cotswold—I may be mistaken, but I have no prejudice against them—the produce of the Cotswold thoroughbreds are not so uniform in character as the produce of well-bred Leicesters. Both flocks being thoroughbred, there would be more inferior lambs in a Cotswold than in a Leicester flock."

Part of the evidence of Mr. Snell, given below, has been already quoted, but may be repeated in this connection. He says:—

"There has certainly been a great improvement made in the quality of the wool, although I think there is great improvement still to be made in that respect by selecting rams with reference to the fineness of the fleece. One of the objections to the Cotswold sheep has been that their wool is too

coarse; but by careful selection of rams with the finest quality of wool, and with the wool uniform all over them, you can improve the quality of the wool very much in the offspring. The United States has hitherto been our best market for Cotswold sheep. The Kentuckians have been our best customers, and they are very particular about the quality of the wool, making that a specialty, and we have been trying to breed our sheep to suit the taste of that market; and I am satisfied that in the last ten years we have made a marked improvement in the quality of the wool. There is a difference in the quality of the wool in different parts of the same sheep. There is a tendency to grosser wool on the thighs. I consider that objectionable. The first place where our Kentucky customers catch hold of a sheep is the thigh, and if they find pretty good wool there they judge that it is good all over the body."

With regard to the comparative merits of the Southdowns and Cotswolds as wool-yielding sheep, Mr. Snell goes on to say:—

"I kept a few Southdowns a few years ago. I am not breeding them at present. If there was any considerable difference in the value of wool, I think it would pay well to raise Southdowns; but the difference between the prices obtained in the market for fine wool and coarse wool is not so great as to make it an object to breed Southdowns, because you cannot get the weight of fleece in a Southdown sheep that you can in a Cotswold, while there is very little difference in the price. The difference in the weight of the fleeces would be, I think, about four pounds per head. A good flock of Cotswold sheep should average nine pounds of good washed wool; I don't think a flock of Southdowns would average more than five pounds, if they would do that. In weight there is, of course, a very great difference."

Mr. Snell adds:—

"The climate gives us an advantage with the Cotswolds, as it is conducive to a good growth of wool. They are not liable to get bare on their bellies, legs and necks."

Mr. Russell, of Richmond Hill, another Cotswold breeder, does not by any means approve of crossing the Cotswolds with the Southdowns. He says:—

"Another circumstance which injures the Cotswold breeders is the fact of shippers advising farmers to cross their flocks with Downs, because they have more profit in handling them; and the wool-dealers have had more profit lately in fine wools, and for this reason complain of the coarse wool of the Cotswold. While the Cotswold has the name of producing all the coarse wool the fact is that there is not 5,000 lbs. of pure-bred Cotswold wool (Canadian) sold in Toronto annually. The coarse wool comes principally from the Lincoln cross. I am not prejudiced against any breed of sheep, but will be guided by the American demand what kind to raise.

"Should the demand increase for Downs, it will not lessen the principal demand for Cotswolds, as there is no cross equal to the Cotswold cross on the Merino, to produce combing wool."

Mr. Russell, it will be noticed, speaks as a Cotswold breeder only. He does not deny either the demand for Down sheep, or the tendency in favour of medium wool.

Mr. Douglass, of Percy Township, Northumberland, keeps both pure-bred Cotswolds and Leicesters. He says:—

"I generally get a clip of ten pounds washed wool from Leicesters or Cots-

wolds, though I have a Cotswold ewe which sometimes gives sixteen pounds. The Cotswolds give a little more wool than the Leicesters, and we get about the same price for the wools. The Leicesters of my flock are the Border or large Leicester breed."

Mr. Smellie, of Vaughan (York), says of the Cotswold:—

"From the Cotswold I get seven or eight pounds of wool. I have always been able to sell my wool, but not at a very high figure. This year after clipping time was over, I think it was 27 cents I got for mine, and last year the price was not so high. Of course if the sheep are better fed the wool is more abundant."

Mr. Cochrane, of Kilsyth (Grey), crosses the Cotswolds with Leicesters, and gives his reasons, and the effect on the clip. He says:—

"My sheep are a cross between Leicester and Cotswold; Cotswold rams upon Leicester ewes. My object in this cross was to give my sheep a better constitution. I have succeeded in getting a better constitution and in making them hardier. For the past six years I have not had a weak sheep in the flock, or one troubled with any disease. I have now a good, compact, stout sheep, improved both as to its size and as to the quantity of its wool. My shearlings averaged last year eight pounds each. I think they have arrived at a greater weight than they were before I started crossing with the Cotswold."



COTSWOLD RAM.

Mr. McArthur, of Ailsa Craig (Middlesex), who keeps sheep representing a cross between the Leicester and the Cotswold, gets from $6\frac{1}{4}$ to $6\frac{1}{2}$ lbs. of washed wool from each sheep.

The Leicesters.

Of the Leicesters there are three varieties, the original, or Bakewell, the Border and the Yorkshire. Of these the first has probably no direct representatives now in Ontario. Mr. Parkinson, of Eramosa, who has already been referred to as a very intelligent breeder of Leicesters, thus refers to the characteristics of the three varieties. He says:—

“The small fine Leicester, which some people call the Bakewell, has been bred in-and-in with the object of obtaining fineness of quality, but it is too tender and too small a sheep for this country. But the Yorkshire Leicesters, for instance, in which breeders have largely retained the quality and symmetry of the Bakewells, and also their feeding qualities, early maturity, and an increased fleece of wool, are the class of Leicester sheep which I consider adapted to this country. The fine English Leicester is a good symmetrical sheep, but it is too small and tender to be a profitable sheep for this country.

“The same qualities which have been obtained to some extent by improving the Yorkshire Leicesters are found in the Border Leicesters, only perhaps the Border Leicester does not hold its wool so well or carry so heavy a fleece as the Yorkshire Leicester; but they are both good mutton sheep, both come to a good size, and both are as hardy as any other long-woolled sheep, and they are as free from disease as the Cotswolds or the Lincolns, or any other long-woolled breed.

“The Yorkshire and the Border Leicesters are about equal in size, and there is very little difference between them and the improved Lincoln, which has been improved by the use of Leicester blood—so much so, that a few years ago, when Professor Buckland was in England and was reporting for the press what he saw there, he testified that the difference between the improved Lincoln and the Leicester was so small as hardly to be distinguished; and according to Youatt’s testimony, all the long-woolled sheep in England owe their improvement to the Bakewell Leicester.”

The fine sheep of which the accompanying plate is an illustration, are of the Border variety, and from the flock of Mr. Wm. Whitelaw, of Guelph.

Mr. Parkinson also mentions an incident referred to by a well-known author, showing how greatly judicious selection, independently of any out-crosses or new blood, may affect the race or breed. He says:—

“A man in-breeding has certain objects that he aims at, and where he has material enough to select from, he is able in the course of a number of years, even by breeding from the same original flock, to produce quite a distinct character. Youatt gives an instance of two men who, there was no doubt, both bred from the Bakewell stock; one aimed at getting large size and a full fleece, and the other aimed at symmetry, which is generally accompanied by a small animal. Neither had any out crosses, and each succeeded in giving the character to his flock which he aimed at, although there could be no doubt that they both had come from the Bakewell stock.”

It matters not for any practical purpose whether selection only, or an infusion at some date or even more than once, of Lincoln blood, may have made our Leicesters what they are. Either the Yorkshire or Border Leicesters have all the characteristics of a well-established breed. Mr. Parkinson’s are the Yorkshire variety,



LEICESTERS.

W. J. L. & CO.

which he thinks approximates more to the Lincoln than the Border Leicester. He describes the difference as follows :—

“The Yorkshire Leicesters are darker coloured on the head than the Border Leicesters; they are shorter in the neck, and they are better filled up in what we call the collar, that is, where the neck joins the shoulder, and the neck never rises so far above the body as it does in the Border Leicester; the neck is more on a line with the back. The Yorkshire Leicester is also, I think, a little fuller or more sprung in the fore ribs. Its fore legs should stand wide apart, and it should grow the wool nearly down to the knee. While the wool of the Yorkshire Leicesters is not so thick set they carry it closer up about their neck, and more underneath than the Border Leicesters.”

It may be taken for granted that in all cases where Leicesters are mentioned in the evidence, one of the two last-named varieties is referred to.

In regard to wool Mr. Parkinson says :—

“The reason why Leicesters do not keep up their wool so well as some other breeds, I think, is this, that mutton sheep are valued more highly in the old country than here, and it is generally found, by sheep men, that a sheep carrying a comparatively fine and light fleece will fatten faster than a sheep carrying a coarser and heavier fleece, and as there is more difference in the old country between the prices of wool and mutton than in this country, they have not regarded the loss of a little wool as being an offset to a sheep that would fatten quickly and come early to maturity. I think that the improvement in the Leicesters has been largely owing to the breeders pursuing a different object from what was followed immediately after Bakewell’s time. Bakewell, who originated the Leicester breed of sheep in the middle of the last century, attempted to get a sheep that would mature early, without regard to size and weight of fleece, and breeders afterwards sought to obtain greater size, and, I think, used the Lincoln in doing so.”

He goes on to say :—

“About two years ago my flock averaged a little over eight pounds of wool to the fleece; last year the average was between seven and eight pounds. If I made wethers of my ram lambs, and had as many shearlings as I had breeding ewes, it would increase the average weight of the wool, because shearlings—the lambs that come early, in the latter end of February or March—have more than a year’s growth of wool, and being well fed, their wool keeps on growing. I don’t think the wool of breeding ewes, after they have lambed, increases in weight, while the wool of young sheep does increase in weight. I have had shearlings that would average between eight and ten pounds a fleece. Between seven and eight pounds would be a general average.”

Mr. Yuill, of Ramsay (Lanark), says :—

“I have been raising pure Leicester sheep for twelve years, generally wintering about thirty-five, but am now crossing them with the Lincoln as they were getting too fine in the wool and small in the body. I sell them for breeding purposes to neighbours. I can sell all I raise.”

The experience of Mr. Douglass, of Percy, in regard to Leicesters, has been already given in connection with his evidence respecting Cotswolds.

Mr. Iler, of Colchester (Essex), while stating that the Cotswolds and Leicesters have been the favourite breeds in that district, says, that, to obtain a medium wool, the Southdown is now being used to cross the long-woolled sheep.

Mr. Andrew Elliott, of Galt, says :—"The Down and the Leicester make a remarkably good sheep to cross."

Mr. Douglas, of Blantyre (Grey), says of his experience with the Leicesters :—

"Thoroughbred sheep are also being introduced, chiefly the Leicester, which is considered the best breed at the present time. I have been using the Leicesters for about twelve years. Before that I tried a cross with the Southdown. I put the Southdown to the common ewes. It seemed to do very well. I just used one for two years, and we thought they were getting too fine and small. I used common ewes for breeding purposes, and I am using a Leicester ram with those crosses. It was because there was a demand for long wool that made it desirable to have Leicesters. I find the Leicester is as hardy as the Southdown."

The Lincolns.

The Lincolns appear to find most favour in the western part of the Province.

Mr. John Geary, of London, says of them :—

"Of sheep I prefer breeding pure Lincolns, as I think they are better adapted to this country than either the Cotswolds or the Leicesters. They retain their wool much better than the Leicesters, and the demand for it is just as good. I have imported a large number of Lincolns from England with a view to their wool, to their quality as mutton sheep, and their general adaptability to this country. I think crossing the Leicesters with the Lincolns produces a good sheep, and one that gives good wool. I breed only pure Lincolns ; they are a very hardy and easily kept sheep."

Mr. Simmons, another western witness, says of the Lincolns :—

"I like the Lincoln sheep, and I think the cross with them has been of more advantage to us than the cross with the Cotswold, both for wool and mutton. As to hardiness, I think the Lincolns are rather more hardy than the Cotswolds. As the matter stands to-day, I believe that the people of our neighbourhood are going more into Lincolns than any other breed, and we have very few Cotswolds."

The Southdowns' Wool.

References to the Southdown as a desirable cross in the present state of the wool trade, upon the long-woolled varieties have been already very numerous. It will only be necessary to supplement them by a few more particularly indicating the Southdown's merits in respect of wool.

Mr. Stephen White says :—

"On account of the long wools going so low in price, I got some of the Southdown breed, and they are succeeding well. The lambs mature earlier than those of the larger breeds, and they are doing well. I get about 12 cents per pound more for their wool than for long wool. I have not tried them long enough to be able to give an opinion as to which is the most profitable, but the Cotswold is generally considered the most profitable for crossing our flocks with, on account of its size. I think, however, from what I have seen of the Southdowns, they will keep easier and thrive better on our land than the Cotswolds, and they don't require so much food. They are not subject to any diseases that I know of."

"There is a demand now for medium rather than long wool, so that wool grown

from crossing the Southdown and the Leicester is more profitable than long wool. The Southdown is a very fine mutton sheep, and for that purpose brings more in the old country than any other. I crossed a few Leicesters with Southdowns last year."

Mr. Alanson Elliott, from the adjoining county of Essex, also mentions the introduction of the Southdown in order to meet the existing demand for medium wool.

Mr. Rennelson's evidence seems to point in the same direction, for he says :—

"This last year the demand for Southdowns was very large. I sold all I could spare at the first show. I attended that, being in Guelph; and I cannot supply the present demand for Southdown ewes and rams. I have not sold at large prices. I have received from \$15 to \$50 for rams; from \$30 to \$50 per pair for ewes. My principal market for those is just in our own Province, though my principal sales last year went to Nova Scotia and Prince Edward Island. There is very little demand for Cotswolds in the neighbourhood of Galt."

Mr. Rennelson, of Galt, says :—

"The wool from half-breed sheep, if fine in texture, brings as high a price as that from pure Southdowns. We have been getting about 30 cents a pound for long wool; 40 cents were paid for Southdown this year in Galt. The demand for this wool is for home manufacture; we sell it to the manufacturer only. The wool produced by this cross is used, I presume, for hosiery work chiefly. I think it would be safe to say that sheep from a cross of the Southdown with the common ewe of the country would, with fair feeding, weigh 150 pounds at fifteen or sixteen months. The weight of the fleece might safely be called six pounds, clean wool. Perhaps under ordinary treatment the Border Leicester is unsurpassed as a mutton sheep, but, for early maturing lambs for market, I consider a cross of the Down much better, and for feeding to extra weights the Cotswold, with his more angular frame, greater bone, and especially his superior muscle, superior to anything else."

Mr. Andrew Elliott, also of Galt, says :—

"There is more demand for Southdown wool now than there was eight or ten years ago. The price of it is rising."

Mr. Peter Clark, of Montague, says :—

"We have forty to fifty sheep every winter. They are common stock, crossed with the Southdown. I have a pure-bred Southdown ram. The improvement is marked since I used the ram. We get about five pounds of wool to the clip, taking the flock round. We send the sheep to the high rough land, and keep the cows on the better land."

Mr. Macfarlane, who, for reasons already given, now keeps Leicesters only, says of his experience with the Southdown :—

"I never saw hardier sheep than the Southdown. I never saw a Southdown lamb suffer even if dropped in snow. Six pounds is about our average clip. The first Southdown ram clipped eleven pounds washed. That was a very extraordinary clip from a Southdown sheep. A ram from that ram, crossed with our own, clipped thirteen pounds. They were extra well fed."

Mr. Douglas, of Blantyre (Grey), says that the bellies of the Southdown are apt to get bare of wool.

Oxford, Shropshire, and Hampshire Downs.

Mr. Clay, of Bow Park, commends the Oxford Downs. He says:—

“The great objection to the Southdown is its want of wool. It is an important item to raise a considerable fleece of wool in this country, and the Oxford Down has the fullest fleece of all the Downs.”



HAMPSHIRE DOWN SHEEP.

Mr. Benson, of Cardinal, leans evidently to the same view. He says:—

“If I began again, I would begin, I think, on the Oxford Down or the Hampshire Down, I don’t know which. The Oxford Down is larger than the Southdown. I don’t know enough about the Oxford Down to give an opinion upon it; but it is said to be a fine large sheep with a good bulk of wool, but whether it will keep its character or not I don’t know.”

Mr. Hood refers to an illustration he had of the value of the Oxford. He says:—

“Last year while I was at Ottawa some woollen manufacturers who were there as a deputation were examining the different kinds of sheep in the show; and they came upon some Oxford sheep which I had there, and they wanted to know what kind of sheep they were. One man pointed out one of them, and he said, ‘There is a good wool, and a lot of it, and that is what we want.’ That sheep was got by crossing the Oxford Down upon the common sheep.”

Mr. Snell does not think the Oxfords are superior to the Leicesters, Cotswolds or Southdowns.

Mr. Rawlings, of Forest, says of the Oxfords:—

“I know something of the Oxford Down. I don’t like the quality much

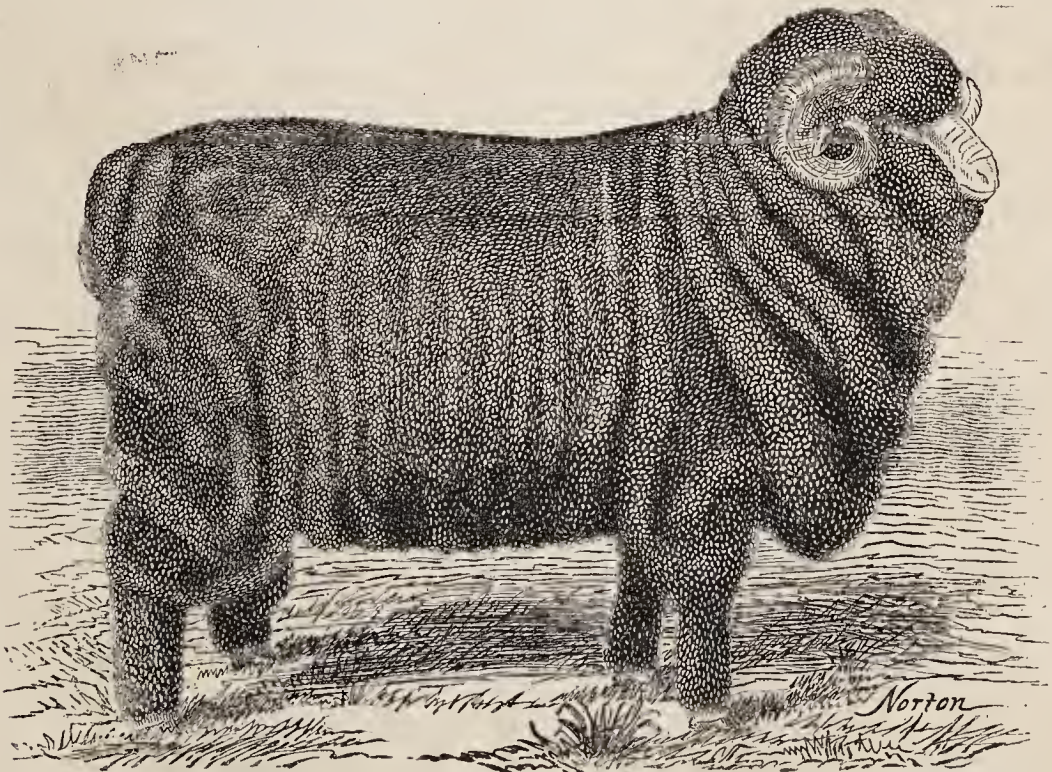
better than the Southdown. I have seen sheep got by crossing common sheep with an Oxford ram. They had the attributes of the male animal stamped on them. These attributes, however, were not so marked as were those on the female side."

Mr. Rawlings is, however, a warm advocate for the use of the Shropshire or Hampshire Downs. He says:—

"I would like to say something in regard to sheep. I was a breeder of Cotswold and Leicester sheep for some years. The sheep I recommend are the Shropshire and Hampshire Down sheep. They seem to do fully as well in this country as in England, and their meat is worth a penny a pound more in Europe, and they are better shippers. I would recommend crossing our Canadian ewes with all Downs, Southdown, Oxford Down, Hampshire Down, etc. I prefer the Shropshire and Hampshire Down sheep, because they have a heavier carcass and have more wool, which is, however, a little coarser. There is a difference between the size of the Southdown and the Shropshire Down."

Merinos.

The Merinos are a sheep not now met with in Ontario, although formerly some few flocks were to be found in the Province. Among the persons who have bred Merinos is Mr. John Gile, of Bastard (Leeds), now a very successful dairy farmer. Mr. Gile says:—



MERINO RAM.

"The flock consisted of between 400 and 500 Merinos. Before the American war they were profitable. I used to get from 45 to 50 cents a pound for the wool that paid well. The flock was kept well up by importing thoroughbred male animals at great cost,

"I am thoroughly convinced from experience that the Province of Ontario is as favourable a field for raising fine-woolled sheep as the Northern States, and if encouragement was given to the industry, our high lands would prove useful and profitable.

"Since the price of fine wool came down, I abandoned sheep raising and devoted my attention to dairying."

Hitherto all the witnesses referred to in connection with wool, have been farmers and sheep breeders. It will now be well to notice what some of the merchants and manufacturers, whose evidence was invited, have to say on this subject. Mr. John Hallam is a large importer and exporter of wool, buying both in the Canadian and foreign markets, and shipping Canadian wool, principally to the States. Mr. Andrew Elliott, of Almonte, and Mr. Bennett Rosamond, of the same place, are extensive woollen manufacturers. With regard to the demand for wool at the present time, Mr. Hallam says :—

"There has sprung up within the last two or three years a demand for medium wools in Canada, such as are used for underclothing, knitted goods for men's and ladies' under-wear, tweeds, serges, and goods of that description. These wools are superseding, to a certain extent, the similar wools that were formerly imported."

He adds :—

"In the United States the demand is chiefly for what is called medium long wools for delaine purposes. There is at present a great objection to the wool of thoroughbreds, on account of its length and coarseness. When I say that there is a demand in the United States for medium wool, I mean the wool from the cross of some fine breed and a thoroughbred, which will give the wool a lustre, and sufficient strength of staple to enable it to comb ; a cross of a Leicester and a Southdown, or a Shropshire and a Southdown, is the class of wool which I would advise the farmers of Ontario to raise in preference to any other kind.

"We have no machinery in this country for using the long, heavy wools profitably, and we have to find a market for them abroad."



SHROPSHIRE SHEEP,

Mr. Hallam hardly intended, it may be supposed, to suggest a Southdown and Shropshire cross as one means of obtaining the desired article in wool. His familiarity is not so great with breeds of sheep as with their product, but his meaning is very clear, and it is the cross between a Down and a long-woolled sheep Leicester or Cotswold, that will supply the need he indicates as existing.

As between the Cotswold and Leicester, Mr. Hallam is, however, probably correct when he says :—

“Previous to the recent change in favour of medium wools, the Leicester wool was more in demand than the Cotswold. The Leicester wool, as I understand it, when manufactured into goods, imparts a lustre to the manufactured article to a greater extent than the Cotswold wool ; it is also more even in staple, is not so bulky, and is a better spinning wool for combing purposes. On the whole, I think the fleece of a thoroughbred Cotswold would be heavier than that of the Leicester.”

The views of the witness are further exemplified in an allusion he makes incidentally to his own recent importations. He says :—

“We require a great deal more medium wool in this country.. Five weeks ago I bought 50,000 pounds of German wool, which is similar to our Southdown wool, but a little more tender, soft, and bulky. What we need in this country is a fine, bulky wool—not a heavy, dead one. Some blankets have a heavy, dead weight, while others have a nice puffiness and elasticity about them, commonly called loftiness. We get that from the crosses which I have described ; and this German wool is very superior in that respect, and is very clean and pure. I bought it for 32 cents a pound, about the same price as that of the Scotch wool.”

And then he alludes approvingly to the wool of the “native” sheep, which, as already remarked, are clearly a mixed race, with probably a strong Down element still lingering in and among them, but largely mingled of late years with the long-wools. Mr. Hallam says :—

“When I speak of the old Canadian sheep, I refer to the old stamp, such as we find around Kingston and the older settlements of the Province. I do not know whether they have Cotswold blood in them or not. I prefer to give five cents a pound more for Southdown or true cross wool than for Cotswold, Leicester or Lincoln—I mean the wool of any of the thoroughbred long-woolled sheep. We still class wools short medium and long medium.”

Mr. Andrew Elliott, of the firm of Elliott, Shirreff & Co., of Almonte, manufacturers of the finer description of tweeds, uses little or no Canadian wool, having to import the classes of wool he requires. Nor did he hold out much prospect of a demand for Canadian grown wool in this country, although admitting that in certain classes of goods it was wanted in increased quantities. He says :—

“We are not able to obtain a supply of the wool we require in Canada. The coarser and longer wools have been chiefly grown in Canada. In western Ontario I used to manufacture the home-grown wools into coarse tweeds and blankets and some flannels.

“There are no mills for making worsted goods in Canada at present, but Mr. Rosamond is building one. That will be supplied chiefly by Australian wool. Some Leicester wool will be required,

"There is a good demand in Canada still for the coarser wools. All the small local mills and some of the larger ones, such as the Cornwall, use a great deal of Canada coarse wools. Our coarse wools are also largely exported.

"Southdown wool would not be fine enough for us, and if crossed with the Leicester would be still coarser. The medium wool produced by a cross from the Southdown on the common stock would be used for a medium class of tweeds. The demand for these has not at present been very large.

"There has of late been a demand for what we know as Scotch cheviots, which has absorbed a good deal of medium wool. They are a class of goods without much finish. The continuance of the demand is a matter of uncertainty. We buy none of this wool and so cannot say anything as to its price.

"For a lustre no wool is better than the common Canadian wool, but the quantity required by us is very small."

Mr Bennett Rosamond was not in Almonte at the time of the Commissioners' visit, but has since, at their invitation, expressed his views in writing, and they very fully accord with those of Mr. Hallam. His letter is worth reproducing in full. He says:—

"We use only a very limited quantity of Canadian wool, and that not by itself but in combination with fine wools to produce certain effects.

"However, even that limited quantity we have great difficulty in procuring of the proper quality. The great bulk of the wool grown in Canada seems to be suitable for only the very roughest and coarsest of tweeds, a fact hardly creditable, one would think, to the judgment of our wool growers, and one which has, in my opinion, seriously interfered with their profits.

"We, in common, I have no doubt, with nine-tenths of Canadian wool manufacturers, would be glad to use a large proportion of native wool, could we only get it of suitable quality, neither too fine on the one hand, such as Merino, nor too coarse and long on the other, such as Leicester and Cotswold.

"Medium wools everywhere, at home as well as abroad, are in greater demand and relatively bring a higher price than finer wools, and, besides, are more easily grown in Canada, and quite as easily, if I am correctly informed, as are the longer and coarser sorts.

"I feel very confident, did our farmers turn their attention more to wools of a Southdown character, the benefit to the country would be greater than most people have any idea of. Our Canadian manufacturers would then have the benefit of a class of wool now at all times difficult to procure, and would be able to produce better and more saleable goods, really Canadian, than they now can do, and the money sent out of the country for such wools would be, instead, distributed among our own people.

"I am very glad indeed to learn that your Commission is giving the matter careful attention, and hope your labours may be productive of good results."

It will thus be seen that the manufacturers endorse the opinions expressed by other witnesses, and that, just as the market for mutton in Great Britain is to be best cultivated and assured by a cross of the Down sheep on the native or long-woolled varieties, so by a combination of the same ingredients is the medium wool of commerce to be best obtained. Before noticing some other matters connected with wool production a word or two may now be in order respecting what are termed not very correctly, but as a matter of convenience, "native sheep."

The "Natives."

"The natives" it is evident have a certain quality not by any means to be despised. They may owe it to chance, their origin being a matter of convenience or accident, not of design or skilful management. But it is clear that, among them, are the materials for rapid improvement, by using upon them the thoroughbred males of the variety that will best supply that of which they are most lacking. They are not likely to be too large, but they may either show too strong a tendency to long wool or short wool in different cases, and the farmer should be guided in the choice of the buck he uses by these circumstances. One thing in all the discussion is most satisfactory, and comes out plainly enough, and that is, not only that, in a superlative sense, do sheep of all the necessary breeds thrive wonderfully well in Ontario, but that every one of the breeds, the merits of which have been discussed (except the Merinos, which were only noticed in passing) has its place to fill, can fill that place profitably to the breeder, and is necessary to the wool and mutton producing industries of Ontario, while even the "native" presents an excellent foundation on which improvements can be made.

Treatment of Wool.

But something more is needed than wool of a particular character or class. And it is to be feared that even the best samples of wool in point of kind are too often sadly reduced in value by the carelessness of the producer. Mr. Hallam buys in all parts of the Province, and has therefore excellent opportunities for judging of the manner in which farmers set about this important branch of business. He says with much commendable plainness of speech:—

"As a rule our farmers do not take enough care of their sheep, consequently the wool is full of seeds, burrs and chaff, which lessens its value one, two or three cents a pound. I cannot say which class of sheep produce the most 'cots.' I think the remedy for 'cots' is in the hands of the farmers themselves. .

"The carelessness of farmers with regard to the care of wool applies both to the fleece on the sheep and after it is sheared. There is not sufficient care taken in shearing the fleece and getting the wool into a good marketable condition.

"I import wools from England, Scotland, and Ireland, similar to our lambs' wools, which have not a burr or a seed in them. You could not find a seed or burr in 10,000 pounds of such imported wool, but I would find 10,000 burrs and seeds in the same quantity of wool raised in Canada. That arises from the carelessness of the farmers in keeping their sheep, and in not having proper appliances for keeping burrs and seeds from the sheep. It is simply owing to slovenly farmers.

"In wool there are what are called 'rejections,' which consist of 'cots,' wool badly washed, wool with seed in it, and wool with chaff in it, and wool with burrs in it; and about twenty per cent. of the wool we get in Canada consists of rejections, while, if care were taken, there would not be two per cent. of rejections, as is the case in English wool."

There can be no reason whatever why Canadian wool should be more dirty than Scotch wool. But Mr. Hallam goes on to say:—

"The wool I buy in Scotland is almost the same as that bought here; I buy it because it is free from all those foreign elements which are so objectionable to the manufacturer. Last week I bought 8,000 pounds of English lambs' wool, and I gave 32 cents a pound for it, delivered here; for our own wool, I would give 29 or 30 cents—that is, about ten per cent. less. We sort the wool into lamb, superb, number one, and chaffy, and burry, and it ranges from 4 cents up to 29 and 32 cents a pound, and the reason that Canadian farmers do not get the highest price for their wool is just owing to slovenly farming."

It must not be supposed, however, that two or three cents a pound is all the difference caused by this want of care on the part of farmers. Specimens of wool were exhibited by Mr. Hallam to the Commissioners, deteriorated to the amount of ten or twelve cents a pound from the same cause.

Mr. Hallam adds one more remark, to which attention may profitably be drawn, when he says:—

"I cannot say whether the want of lustre in the Canadian wool is owing to the want of breeding or the want of management; but I have always found that good farmers, who feed their sheep well, have good lustre wool. There is no lustre on the wool of the old Canadian sheep.

"The average weight of the fleeces we get from farmers who pay no attention to breeding is about five pounds, from those who pay some attention to breeding six or seven pounds, and from those who follow fancy breeding nine or ten pounds. We buy unwashed wools, but we take about one-third off the price when wools are unwashed."

Good feeding, good breeding, and good management means, it will be seen, good wool as well as good mutton.

FEEDING AND MANAGEMENT OF SHEEP.

The last allusion suggests some reference to the feeding and general management of sheep.

Mr. Hobson buys lambs largely for fall feeding. His plan is described by him as follows:—

"I generally take 200 lambs and upwards for fall feeding. I feed them largely on rape, and also on oats and turnips when the weather gets bad. They paid very well last year; the increase in price at which I sold them was about \$2 a head. The average weight at which I have sold them has been a little over a hundred pounds. The last lot I sold on the 12th December averaged 107 pounds. The land on which the rape is raised I summer fallow, but do not manure. The manure of these sheep is valuable and an important consideration in feeding them.

"I usually sow the rape during the first damp weather after the haying begins, about the first week in July. I sow it with a drill and ridge it, though I think it is fully better to sow it on a flat. I keep sowing it thinner and thinner every year. I would not put more than three-quarters of a pound to the acre; the smaller quantity you sow the better. I usually have in view a partial cleaning of the land at the same time.

"I vary in the number of acres which I sow with rape. I usually sow from ten to twenty acres, sometimes as many as thirty acres. I generally have a very heavy crop of rape. I very commonly use plaster on the land, and I believe,

taking one season with another, that 150 pounds of plaster will double the crop of rape."

Mr. Hobson's opinion as to the profitableness of sheep feeding is valuable. He says:—

"The price which I pay for lambs varies very much, but they usually run up to about \$2.50. The year before last I had to sell them at \$3.62½, and there was not very much profit in them, but I never pass by good sheep if they come in the way when I am buying lambs; and in the same season I sold a lot of over 150 sheep, all of which went to the English market, and while I had not got a large increase on the price of the lambs the sheep were sold for something over \$6, and I made very well on them. The business of feeding sheep is a very profitable one."

Mr. Benson, from an entirely different section of country, is of the same opinion as Mr Hobson. He says:—

"I think sheep raising is a profitable branch of industry. But for the sheep much stuff might go to waste, and they are very useful in the wilder parts of the land in preventing noxious grasses from growing up. They nibble at grasses that cows won't touch; and in winter they cost very little to feed, as you can feed them almost entirely on straw and hay. You can keep a hundred or two sheep, and not feel it. They eat up the offal, and if you feed them on turnips, as the English farmers do, it is a grand way to improve the land; but the nature of the climate here is against feeding turnips to them as they do in the old country. I would sell them as lambs if I could get good prices for them, but the wethers can be kept till the following year."

Mr. Benson farms from nine hundred to a thousand acres of land representing some half-dozen contiguous properties with buildings thereon. Hence his ability not only to keep a large number of sheep but to divide the sheep into small flocks of fifty ewes to one ram—the latter kept separate from the ewes. His treatment of sheep in winter is in accordance with the plan of most other witnesses. He says:—

"I never enclose my sheep in winter. My yards are very comfortable, and there are sheds accessible to them where they can run in and out at liberty, and I think they keep better in that way than any other. So long as they are protected from the winds and storms, they are better in the open air than shut up. They have been out sometimes when the thermometer is as low as from twenty to thirty-five degrees below zero; but that is generally upon bright days when the sun is shining warm, and the sheep like to be in the open air. I feed them hay in racks, into which they can put their heads. If we are feeding them on straw, we throw it to them in the yard, and what they waste is used for bedding. I have never had more than fifty or sixty in one yard; my buildings are numerous, owing to there having been a number of farms on my place. The open sheds for the sheep are built beside the barns. The thoroughbred lambs are never put to the rams before they are one year old. The finest of the early common lambs may go to the buck in the fall; this seems to save a year, and I do not think they are very much the worse for it. I usually pick out the worst of the ewe lambs and sell them; I only keep the best for breeding purposes. I would rather not use ram lambs for breeding. I breed the second year. I have no particular time for selling my lambs; I always sell them whenever I can get a good price for them."

Mr. Benson's situation is one subject to low temperature, and therefore if the sheep were ever in need of warm housing it would be there.

Mr. Parkinson's system of winter feeding is as follows:—

"In keeping my breeding ewes in winter I feed them with pea-straw in racks, and alternate this with hay. At first I give them a good deal of pea-straw, and give them a feed of hay perhaps three times a week, because they will eat hay better after they have had pea-straw a while, and will take to the pea-straw better after they have had hay a while. In addition to the pea-straw I feed breeding ewes turnips once a day—about two bushels of turnips to twenty ewes; and in addition to that I give them once a day a small feed of grain—not a pint each—with a little chopped stuff and bran. After they have lambed I give them more turnips—twice or three times a day—and all the clover hay they will eat; and in addition to that I boil some oats and flaxseed and mix it with cut hay, bran and chopped stuff, and give them two feeds of this a day."

As to shelter, Mr. Parkinson agrees with Mr. Benson. He says:—

"In the winter I prefer keeping my sheep in open sheds, with a yard fenced closely enough to protect them from the wind; in this way they can have plenty of exercise where the air is always pure. There is no class of stock that is more sensitive to foul air than sheep, and if they are confined in close pens during the night you will find a bad odour arising from them in the morning. Besides, if sheep are shut up so that they sweat and get their wool damp, and they are then let out with this dampness on their wool, they are very likely to take cold; but as long as you keep their wool dry and protect them from the wind they will stand the cold weather very well. On calm nights in winter I have found my sheep outside in the open yard where they preferred to be rather than in the shed. I am more a breeder of sheep to sell to the farmers than a feeder. I have principally bred to sell for breeding purposes."

Mr. Motherwell, of Bathurst (Lanark), says as to wintering sheep:—

"The fewer sheep in a flock the better. I think sheep pay better than cattle, but would prefer to keep both. Sheep in the winter should be sheltered, but not kept too warm, and the lambs separated. I feed the sheep on hay, and give the lambs grain every day. They should have the run of the barn-yard."

Mr. Smellie, of Vaughan (York), expresses the same opinion.

Mr. Stone, of Guelph, says:—

"In the winter time the sheep are too much confined in this country; it would be better if they were allowed to be more in the open air. I would leave them outside, and let them have plenty of exercise, until the lambing season came on. Our ram lambs last year, although they were allowed to run out of doors last winter, did very well. In all these things I judge very much by the habits of the animals. In hard, dry, freezing weather the sheep like to be out on the snow, but not in stormy weather, and I believe they are better to be outside than to be shut up.

"I do not feed turnips every day to the breeding ewes. Last year we stopped doing so, and I think we had better luck. If we give them turnips, we may feed them an odd one or two, but that is all. We give them bran sometimes. I think turnips are bad for breeding ewes if you allow them to eat all they can. They are likely to gorge themselves, and that injures the lamb. I do not give them grain very often; but, about a week after lambing, we of course feed them turnips and grain (oats and peas), and it won't hurt them."

Mr. Stone adds that, in his belief, a great many sheep have been spoiled in this country by poor feeding.

Mr. Hood's method of treatment is as follows :—

"I would like to have lambs come in March if there is a place to keep them in. After taking them off the grass in October I would put them on turnips and grain—peas and oats if I could get them. I would also probably give them a little bran, as well as hay and pea-straw. To the lambing ewes I would give a little mash. I prefer letting the lambs run with the ewes; if you do not separate them it will not be many days before the lamb will begin to nibble with the ewe. I think it would pay to feed the sheep during the first year of their growth on grain or to soil them in the field. I am feeding partly on green peas and oats; the sheep are fond of that, and you can feed them almost as cheaply upon it as upon pasture. They prefer it to clover. I keep water accessible to them all the time, and give them any amount of salt. I would wean the lambs in August at the latest, and, during the ensuing winter I would give them a good quantity of roots at first, and not too much grain."

Mr. Snell does not appear to dread the effect of keeping sheep in large flocks. He says :—

"The number of sheep that a farmer should keep in one flock depends on the quantity of room he has, I think there need be no limit to the number if he has room enough. I know there is an idea prevalent that Cotswolds cannot be herded together in as large flocks as the finer woolled sheep; but I don't think there is anything in it. I have seen Cotswolds herded to the extent of four or five hundred, and as high as eight hundred in the old country, and doing well. We could keep them in this country very well, on farms of from two to four hundred acres, in flocks of two hundred to three hundred. I think any class of sheep, either the fine-woolled or the long-woolled varieties, will do better when kept in small lots than when kept in large lots."

He adds :—

"On an ordinary farm of 100 acres I think a man could profitably keep 30 sheep; and a farm of 200 acres ought to maintain from 60 to 75 or 100 sheep. That is under a system of mixed husbandry, of course."

Mr. Snell's system of feeding is as follows :—

"In the winter time we keep the sheep in open sheds, with doors that can be closed in case of stormy weather, so that they can run in and out of the yards at pleasure. We feed them in racks in the house, principally on clover hay. We feed a good deal of pea straw to our breeding ewes; to the young sheep we feed clover hay, and roots. I think from the experience I have had that to feed roots to ewes with lamb is injurious to the lambs. It makes the lambs weak. Old country shepherds say that when they have a big crop of turnips they have a poor crop of lambs. We feed them plenty of turnips after they have lambed. During the winter time we also give our young sheep a little grain—peas and oats mixed—and two or three weeks before lambing time we give the ewes a mixture of peas and oats and bran."

Mr. Russell says as to feeding and winter treatment :—

"In the winter I feed pea-straw, hay, and turnips, to sheep. Good shelter from the cold winds is of great benefit, at the same time they require an outside yard, to be healthy."

Profits of Sheep Farming.

With regard to the profits on sheep breeding, opinions will vary. In this case the breeder has to take into account a different class of circumstances affecting profit and loss from those which influence the calculations of one who is only a buyer and feeder. Some witnesses have expressed an opinion that the profit is greater on selling lambs than on keeping the sheep over winter and then shipping them to Europe. It seems to be pretty clear that the profit on sheep kept for their second clip is not in proportion to that realized by their sale in their first summer as shearlings.

Mr. Rawlings says on this point:—

“The most profitable time for farmers to sell their sheep is after they have taken the first wool. I would advise them to keep their lambs during the winter, take the first wool, and sell them after July. That would bring them the most profit.”

The wool, too, of the first clip is usually of the finest quality. What the shearling, or its wool, will be worth, is of course dependent on breed and feed. It is not intended to argue that a common sheep, with a 4 lb. or 4½ lb. fleece and bringing 4 or 4½ cents, live weight, at the highest, is a profitable animal anywhere. Professor Brown puts the difference in value and profit between the common and the improved sheep as follows:—

“The difference between the value of a well-bred grade and a common sheep is thus shown:—

	Common Sheep.	Improved Cross.
Common wool, 5 lbs. at 27c.	\$1 35	
Improved wool, 8 lbs. at 35c.		\$2 80
Common mutton, 140 lbs. at 4c.	5 60	
Improved mutton, 170 lbs. at 5½c.		9 35
	<hr/>	<hr/>
	\$6 95	\$12 15
		6 95
		<hr/>
Difference		\$5 20

Or, \$520 in a flock of 100.”

That these calculations are correct in so far as they apply to a first-class animal over a common one will probably be assented to by most. But it must be allowed that the improved grade sheep of farmers generally will hardly come up to the standard given above.

Leaving out of view the extraordinary clip of wool obtained here and there by successful breeders, it will be safest to place the average weight of medium wool, say from a Southdown and Cotswold or Leicester cross, at 7 lbs. For good medium wool, 35 cents would be an average price. Nor does there appear, from the

evidence, to be the least difficulty in bringing a good grade shearling up to 160 lbs., live weight. While 5 cents a pound may be assumed as the value of mixed lots of sheep of fair quality, it is freely stated that cargoes of wethers would probably bring 7 cents. One witness had actually paid $7\frac{1}{2}$ cents in Buffalo last March for such a shipment. That, for really good grade wethers of suitable size, 6 cents may be obtained, it is quite reasonable to believe. But to avoid misleading any one it may be safest to take $5\frac{1}{2}$ cents as the basis of the present calculation. At that rate a shearling wether, weighing 160 lbs., shipped in May to Europe, would bring, at $5\frac{1}{2}$ cents per lb., \$8.80, having already yielded a clip of wool, say 7 lbs. at 35 cents—\$2.45—and with the universal testimony to the value of the manure of sheep, it will not be too much to assert that 75 cents will be fairly gained to the farmer from that source. That makes a gross return on the shearling of \$12. On the other hand, what has he cost? Probably the following account will be nearly accurate :—

Proportion of sire's services	\$0 50
Mother's keep during milk.....	2 25
Extra food, bran and meal, from March to October.....	1 15
Grazing.....	0 20
Dipping	0 03
Winter keep, October to May	2 25
Washing and clipping.....	0 10
Proportion of management; casualties, etc.—say.....	1 00

Total cost of shearling.....\$7 48

Showing a profit of \$4.52.

In this connection it may not be amiss to notice the results of selling the same animal, not as a shearling, but as a lamb, in the fall. To the latter the first four items of expense will certainly apply, and, as casualties are greatest in the earlier months of the creature's life, so it will hardly be unfair to charge it with at least two-thirds of the dollar (66c.) representing that item in the above statement, while on the other hand, the manure previous to the wintering period is hardly worth anything. The cost then of the lamb on the same calculation as the shearling will be \$4.76, with no incidental return previous to marketing. Its value at that stage appears to fluctuate greatly. When lambs bring such sums as occasionally have been mentioned—\$7 or \$8 a head—farmers can hardly be blamed for disposing of them, but the ordinary prices are much lower. Three dollars to four dollars and a half will be nearer the mark. The farmer will occasionally be obliged to sell his lambs, but the better the farmer the more he will strive to retain them, to bring them to the highest pitch of excellence both in wool and mutton, and to improve his farm while he is improving his breed of sheep, thus rendering it every year capable of sustaining a larger flock.

On one point the witnesses were a unit, and that was the inadvisability of using ram lambs for breeding purposes. The practice is condemned by all as

tending either to the weakening of the flock, or not unfrequently to the loss of a season altogether. One mature ram will very well serve fifty or sixty ewes in a season.

The Southdown is admitted to be the most prolific of the breeds, frequently having twins and losing few by cold or exposure. Mr. Parkinson, however, has no reason to complain of his Leicesters in that respect. In 1876 he got thirty-six lambs from twenty ewes; in 1877, thirty-three from twenty ewes; in 1878, thirty-one from twenty-three ewes; in 1879, thirty lambs from twenty-two ewes; and in 1880, twenty-eight lambs from twenty ewes, or a total of one hundred and fifty-eight lambs to one hundred and five ewes, an increase of just $1\frac{1}{2}$ per head. Professor Brown gives $1\frac{1}{4}$ per head as a good average increase.

The healthiness of sheep in Ontario has been already noticed. Where fatality occurs it is usually traceable to some specific and local cause, or to mismanagement. Over-feeding previous to lambing has been mentioned as having occasioned loss to the breeder in some cases. Staggers is a form of complaint not altogether unknown, and *goitre* in the neck, in one flock mentioned, while other neighbouring sheep were healthy, was pretty clearly traceable to the character of the water. And, as the exception sometimes proves the rule, so, in one instance, the appearance of foot rot some nine years ago, and of foot and mouth disease once, subsequently, in one district, was mentioned, but only accompanied by the further information that with ordinary care and remedies both were speedily stamped out. There was nothing to foster either, in the dry, healthy, bracing atmosphere of Ontario.

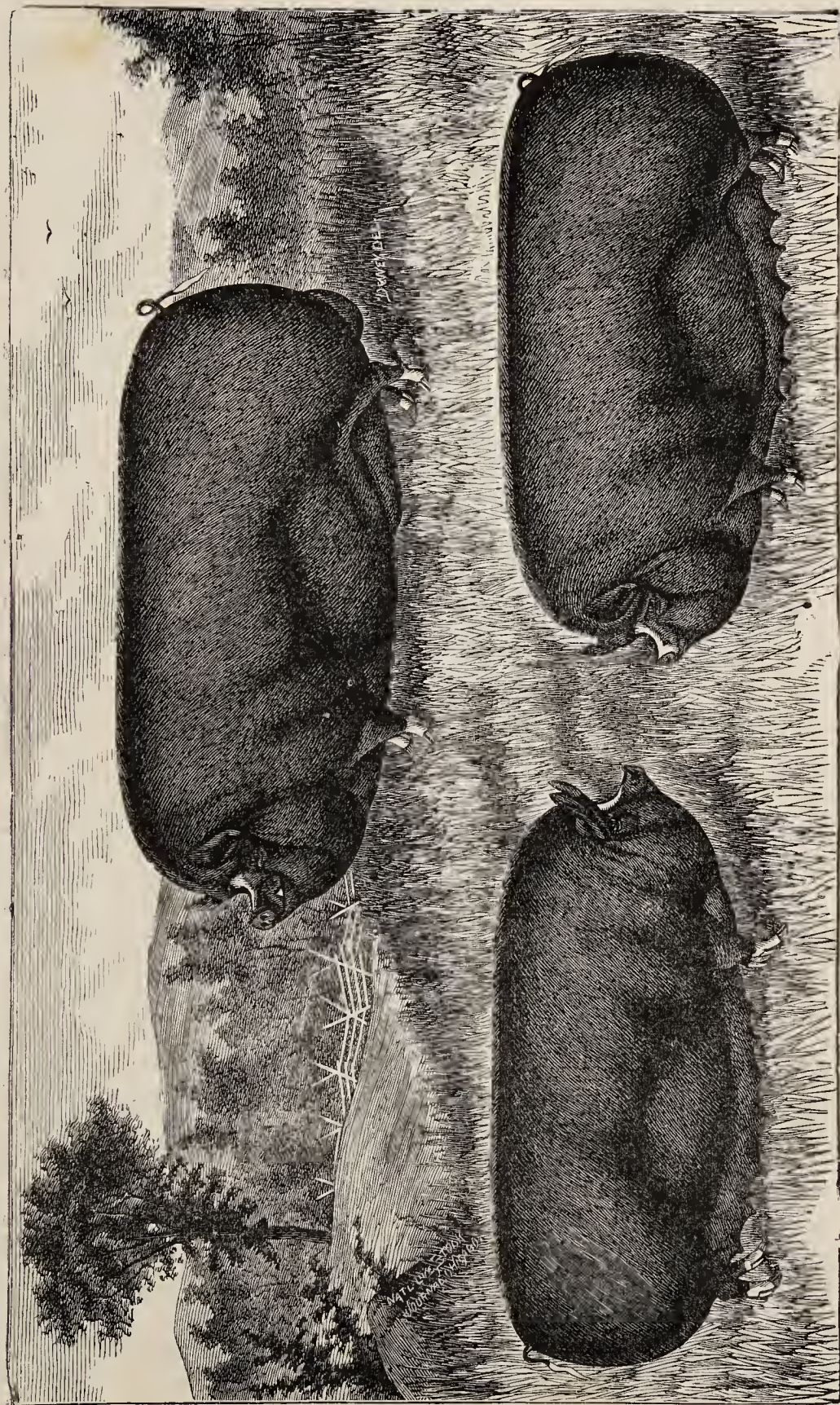
HOG-RAISING.

Except in the south-western corn-growing counties and, in some cases, in connection with cheese and butter factories, hog raising is nowhere carried on upon a large scale in Ontario. Only in Kent and Essex did anyone pretend to find it a profitable business beyond the supplying of the family demand and the disposal of a small surplus after that had been satisfied. The evidence relating to pork raising is, consequently, not very voluminous, but has its points of interest nevertheless. Mr. Anderson, of Puslinch, put the matter very correctly when he said:—

“I consider it profitable to raise pigs in this country, for breeding, but not for butchering. . . . I don't think pork raising has been profitable in Canada during the last few years, when the price of grain is taken into consideration. I think our coarse grains can be better applied than feeding them to hogs. We cannot compete with the large corn-growing regions of the west in that respect.”

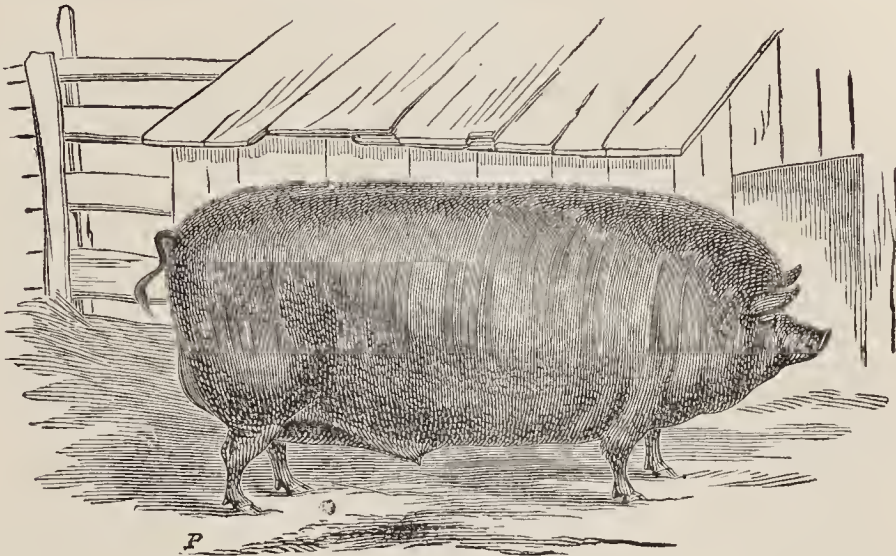
Mr. Anderson strongly favours the Essex breed. He says:—

“I have used the smaller breeds—Berkshires and Essex, and Mr. Brown's breed, the Windsor. . . . I have had both Berkshires and Essexes until recently, when I have given my whole attention to the Essexes. I think they are more profitable, for the amount of feed consumed, and come earlier to maturity.



BERKSHIRES.

I can generally sell all I can spare. Prices are not so high as they were. I used to sell to the United States people a good deal, but lately Canada has been my chief market. I give the preference to the Essex for early maturity. If I were selling on the market, the Berkshire might be more profitable, but for family use I think the Essex is more profitable. I find the Essex to be as hardy and prolific as the Berkshire. When I had both Berkshires and Essexes I crossed the two breeds, and got a splendid cross. There are dozens of my neighbours bringing their Berkshire sows to my Essex boar, and they prefer the first cross to the pure-bred animal for feeding purposes."



ESSEX BOAR.

Mr. Snell on the other hand is a supporter of the Berkshires, of which he is a successful breeder. Three of his herd are represented in an accompanying illustration. As he has had fifteen years' experience of the breed, what he says may be worth quoting:—

"The only breed of pigs that I have been raising for the last fifteen years is the Berkshire. I had some experience in breeding Suffolks and Yorkshires previous to that time. The Berkshire would be classed with the small breeds, I suppose, but they are larger than the Black Essex and other small breeds. I would call them a medium-sized hog. The Yorkshire is a large breed, the Suffolk and Essex small. I think a medium-sized hog is the most profitable. A small breed will perhaps get fatter at an early age—say at four or five months; but one objection to them is that they get too fat—that there is more fat than lean in them—that their meat is not marbled. At a year old the Berkshire will beat the Suffolk by nearly 100 pounds, and his meat will be more marbled—there will be a larger proportion of lean than fat.

"The Berkshires mature much earlier than the large breeds, and they can be fattened at almost any age. I think it is more profitable to fatten a Berkshire pig at eight months old than to keep it over the winter. At eight months old we can bring them to 200 or 225 lbs.

"I have been breeding, not to supply the general market, but to sell hogs for breeding purposes. At the prices we get here for pork I do not think there is much profit in raising pigs for pork, and we cannot at all compete with the Western States in producing pork profitably.

"In my opinion the best time to have pigs dropped is in March or April.

"Young pigs should be fed with milk, slops, and shorts. When you want to fatten them I think peas are the best feed for that purpose. In the winter season we let the breeding sows run out, and we feed them on peas. I think peas are better for breeding sows than slops. After they have pigs, we prefer to feed them slop feed, swill, and shorts. When the dam is fed on strong feed like peas, the young suckling pig is likely to have its blood heated and its legs crippled. I think it is best to have a yard or a clover or grass field for pigs to run upon in the summer time."

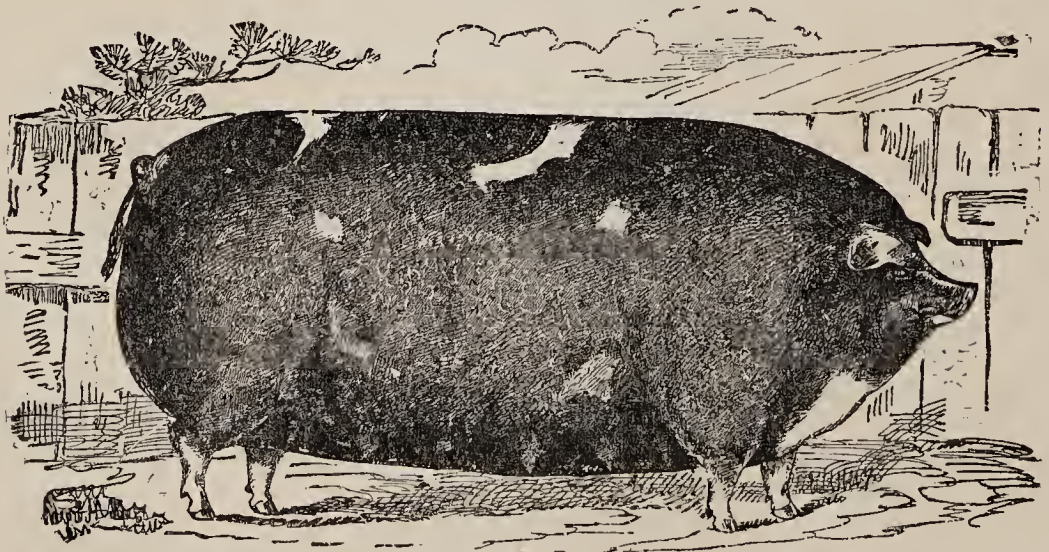
Mr. Alanson Elliott, of Colchester (Essex), is in the heart of the Ontario corn-growing region. He says:—

"Ours is a great pork-raising district, and we find the industry a profitable one. Our average price would be about \$6 a hundredweight, and pork pays well at that price. We would not consider ourselves losing even at \$5.

"I prefer a cross between the Berks and the Suffolk or Essex. The Essex is a small, compact animal, which fattens well. Our pork is shipped east, a great deal of it being sent to Aylmer, where it is packed. Montreal buyers also take a good deal, and I suppose it goes to the States. Buyers say that we produce the best pork in Canada. By crossing the Berkshire on the Essex we get a smaller animal but a finer grade, the meat being fatter but not so coarse. I think such a cross would produce pork well adapted to English consumption. We had a pork-packing establishment in Windsor some time ago, but it failed. They bought for the English market, and they preferred hogs leaner than ours."

Mr. Iler, also from Essex, gives testimony on the whole confirmatory of Mr. Elliott's. He says:—

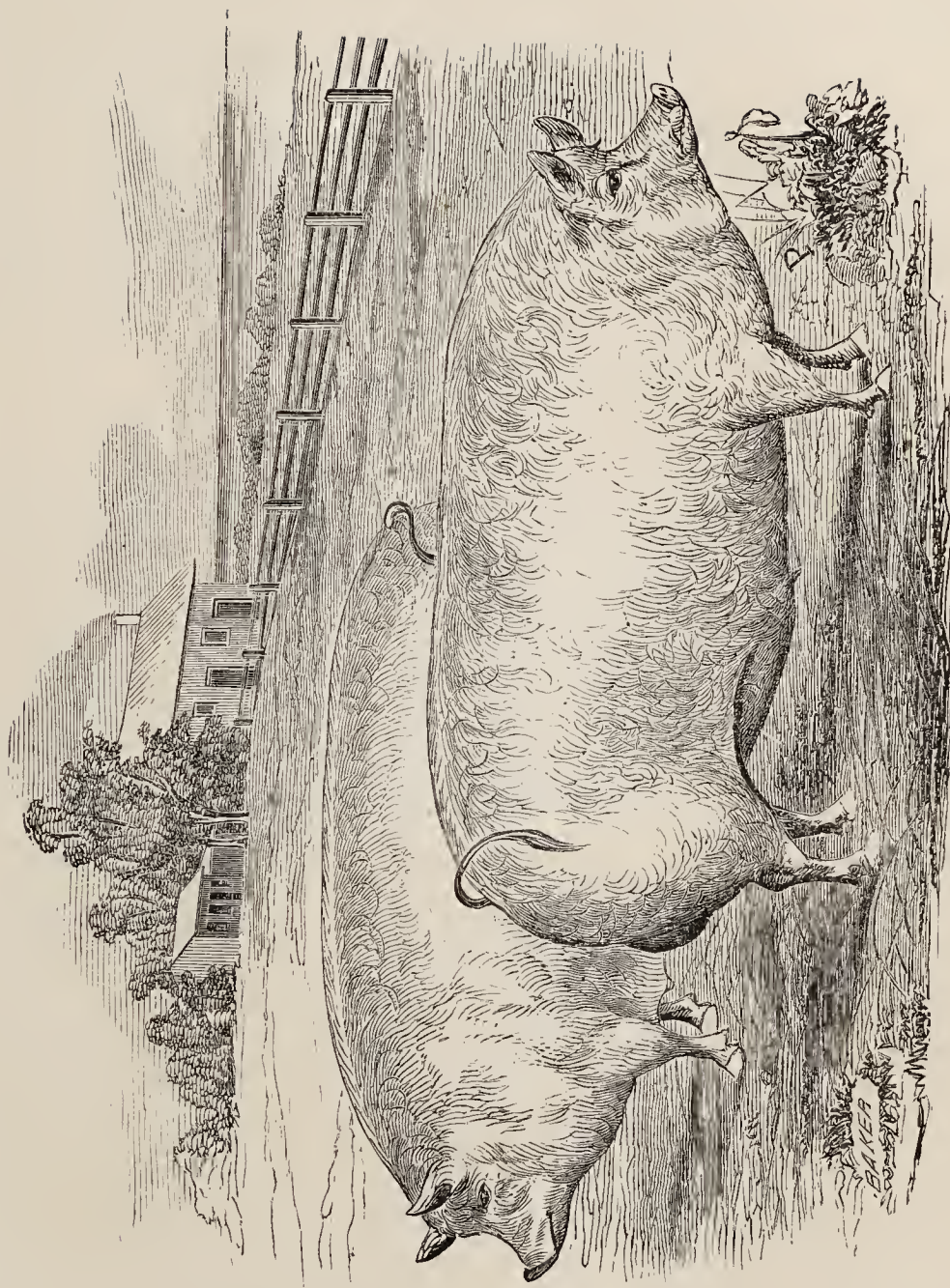
"We feed pork considerably with corn, and that industry can be successfully carried on in Essex. Pork raising is profitable if we get \$5 per cwt. for it, but it is not profitable at any lower price. We average pretty much about that price



POLAND CHINA.

for our pork, so that I consider the industry profitable. Farmers who have 100 acres, generally keep, for stock and fattening, about forty hogs.

"At present our hogs are generally pretty well bred. We have two or three breeds—the Essex, the Suffolk, and the Berkshires—and some have paid attention to Poland Chinas. I think a cross between the Berkshire and the Essex, is better



LARGE ENGLISH WHITE BREED.

than either of these two breeds, as they come to maturity sooner, and fatten more readily. Pork feeding is rather a local and peculiar industry with us, owing to the large area of corn which we cultivate. Some farmers fatten as much as 9,000 lbs. of pork in a year. The average number of hogs fattened on a farm of 100 acres would be about twenty, and twenty more are kept over. The production of pork is not increasing very much.

"We generally export our hogs, for, though we have a pork-packing establishment in Windsor, it is on a small scale. I think it would be more profitable if we had the packing industry carried on in our own district."

Mr. Wm. McGregor in his report says:—

"We do not export largely of corn, but we sell about 100,000 bushels a year to the distillers in the county. The remainder is used in feeding pork, which brings us in annually, about \$400,000. . . . Our production of pork is almost as certain as the season itself. Our pork is the same as the American pork, because it is fed in the same way—that is chiefly upon corn. It brings as much as any pork in the market."

The Hog that is Wanted.

For pork used in the lumber shanties, whither doubtless goes much of the Essex products, fat hogs will always be in demand, and no one needs to be told at this time of day how greatly the imported stock has improved the native breed. In the counties mentioned the farmers know what will suit their market, but it is in this, as in all other cases, the farmers of Ontario generally, not merely those with whom hog raising or feeding is a specialty, whose interest the Commissioners have more particularly in view. They have therefore taken evidence with the especial object of ascertaining what class of hog is now most in demand, and how that animal may most easily and profitably be obtained.

Mr. Wm. Davies of Toronto is, probably, the most extensive pork packer in Canada. His trade is almost exclusively with Great Britain, and the department he addresses himself to is the curing and packing of bacon and hams. His supply is mainly from the Western States, farmers raising too few hogs in Ontario to meet his requirements. Between May 1870 and 1880 he killed and packed 50,000 hogs at his establishment at Toronto. His experience as to the class of hogs required is given as follows:—

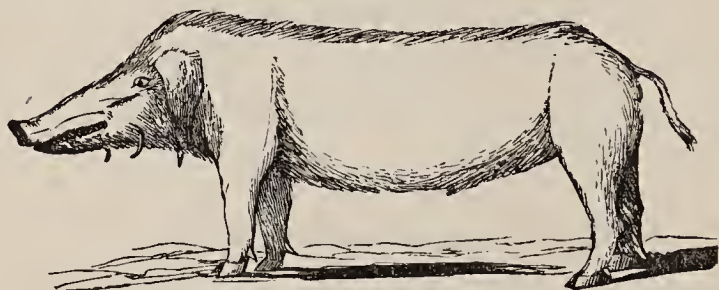
"The class of animals I require are hogs ranging from 160 to 240 pounds, live weight—and we must have them alive. We do not buy dressed hogs at all. We consider it very bad economy to do so, because we can kill and cut up a pig in a great deal less time than a farmer, besides making much better work of it.

"The kind of hog we desire is a lean hog; but I would here guard against the idea that we require a thin hog. While we want it lean, we want it well fed; a great deal of fat, instead of being an advantage, is a great disadvantage. We like a long hog, or, as a prominent English packer described it recently in a Chicago paper, something like the old 'racer' breed crossed with the Berkshire.

"When I speak of 'racers,' I mean the common Canadian hog with a long snout and long legs, somewhat modified. The common Canadian hog, crossed

with the Berkshire, would, I think, be about the kind of animal required for the English market. In short, what we want is a meaty hog, but not a fat hog."

Lest any reader of these notes should fail to understand what the "racer" really is, an illustration is presented for his examination. He has chiefly been notorious in the past for somewhat predatory inclinations in which he has been assisted by long limbs, great activity of motion, and a snout that was said to fall short of the truly useful and meritorious if it failed to reach the second row of corn through a snake fence. Now, combined with some finer imported breed, his utility may be more highly appreciated.



THE "RACER" OR "ALLIGATOR" PIG.

Mr. John Beattie of Seaforth, also a packer, gives similar evidence to Mr. Davies as to the kind of hog wanted. He says :—

"The hogs we preferred were those weighing about 150 or 200 pounds dressed. If a person could get a sufficient number of hogs of that weight, he would do better than with a heavier article. For every order for hams weighing from 14 to 16 pounds we usually get ten for those weighing from 8 to 12 pounds. I think it is a mistake for our farmers to go into the raising of hogs of large size.

"It pays packers very well to get the fat meat, but you cannot sell it so well in the English market ; a lean ham and a lean side are what are in demand there. For the lumbermen, coarse, fat meat is better. I think the hogs raised in Canada are as well adapted for the lumbermen as western hogs."

Mr. Hall, of Liverpool, whose evidence in regard to shipments of cattle and sheep has been frequently quoted, has been a pig fancier in the old country. He does not approve of a long-nosed pig but would generally approve Mr. Davies' views as to the conformation of the desirable bacon hog. He says :—

"I like a pig as straight as a Leicester sheep, good short nose and good jowls, and I want them good behind the jowl. If they are such animals as that, then they are like all other animals, good to follow and good to meat, good in their hair, good through their hams, and good on their loins. I have often seen pigs at our shows that I would almost term malformations, extraordinary forward and good in the hams, but very weak in their loins."

Judging by some of the "racer's" performances, he is hardly open to the charge of being weak in the loins. Mr. Hall suggests a breed as likely to prove useful in this country, and about the stamp of animal required, an opinion in which the Commissioners believe Mr. Davies would concur. Mr. Hall says :—

"The pig that I think the most profitable that any man can breed is the middle bred white Yorkshire with plenty of hair. In this country you want pigs with

plenty of hair or they will get scorched by the sun. Length is desirable in a pig, because when you get length you get well mixed bacon. The taste of people of means in England has always been in favour of bacon with lean in it ; and now country people too require finer bacon than they used to—they want a meaty pig rather than a fat one. There is no one who has been so successful in raising pigs as the Earl of Ellesmere and Peter Eden, near Manchester. They have been wonderfully successful with their pigs. I think the Berkshire breed is a very fine one, and I am led to believe that it makes the best bacon ; but I do not think the pigs of that breed are as quick growers as the middle-sized Yorkshire.”

After the middle-sized Yorkshire Mr. Hall would use the Berkshire, and it is by no means improbable that, by the cross of the Berkshire on the “racer,” or native breed, the precise style of hog just now most popular will be obtained. The Poland China is not very far from the required standard, but is described as a somewhat coarse animal. The reason for the change in the demand for hogs in Canada is the very great alteration in the taste of the British consumer. Mr. Davies says :—

“The markets supplied by me, for which the kind of pork I have described is required, are the London and Liverpool markets for city consumption ; but the country requirements in England now are very similar to those of the city. Since the farm labourers have become better off, they will not eat chunks of fat as they used to.

“There has been a very great change in the demand for pork in England in recent years, which I attribute to the improved condition of the working classes. An ordinary Englishman now wants his meat mixed, and not a mere chunk of fat to flavour his bread with.”

Feeding Hogs.

Mr. Davies has, however, a word of advice to the Ontario farmer besides telling him what hogs are most in request. He says :—

“Many hogs in Canada are killed when they are not more than half fat ; they are not merely thin on the back, but the belly, the prime part, is almost like a sheet of paper. This, I am told, is owing to the farmers letting their hogs run adrift as soon as they leave the mother, and get their living on the roadside. They are then shut up and hastily fed, and then they are knocked on the head.

“It is my opinion, as well the opinion of those of more experience, that hogs, like any other animals, should be well fed from their earliest days. At the present time we would give fifty cents per hundred pounds more for good medium hogs than for large, fat hogs.”

Mr. Davies goes on to say :—

“Canadian hogs are a good deal better than western hogs, if they are fed just as well ; because Canadian hogs are fed on peas and barley, which make the fat firmer and produce more flesh, while American hogs, which are fed on corn, have a less firm fat and a smaller quantity of flesh ; but the American hogs are much superior to the Canadian hogs in regard to their body being uniform. The Canadian pork is rather primer meat, as it consists more of lean flesh and less of fat.

“At present we are paying from five to five and a quarter cents a pound for Canadian hogs ; that is more than we have been paying formerly. Of the hogs we want, we do not get more in Canada than about 3,000.

"Some of them come from as far west as London, St. Thomas and Chatham. Those from the latter places are much more like the American hogs than most Canadian hogs, which I account for by their being fed on corn and being much better bred. A great many hogs from that part of the country are pure-bred."

The experience of this well-qualified witness is favourable to butter and cheese factory-fed pork, but only when some grain is fed with the whey. He does not like the distillery fed pork so well as pork fed by farmers, considering both fat and lean to be softer. Peas and barley make the best pork, while mixed feed, such as boiled potatoes and milk, is highly approved. Mr. Davies' allusion to the Irish pork may embody a useful hint or two. He says:—

"We can never hope to compete successfully against the Irish pork, partly because it is so near the market, and partly because the hogs in Ireland are fed and bred with great care. They have contrived there to get the hog as thick in the belly as in the back; but I should suppose that it would not be difficult to breed so as to obtain that perfection. I do not know the process of feeding hogs in Ireland; but I have been told they are fed on oatmeal, barley meal, potatoes and milk, boiled together. Certain it is, that the fat of Irish pork is rich and luscious—not oily, as on this side of the Atlantic."

Live *versus* Dead Hogs.

On one more point Mr. Davies is very emphatic. He says:—

"I think Canadian farmers stand in their own light in killing their own hogs—certainly those do who live a great distance from Toronto. When the farmers kill their own hogs, a great deal of the inside which we can utilize by killing a large number together is comparatively wasted.

"If a farmer keeps his hogs alive, he can time his sales and choose his customers. If a number of neighbouring farmers have not enough each to make a shipment, they may club together and bring their hogs to Toronto. It seems to me a great pity that a valuable animal should be comparatively ruined by being killed a hundred miles from where it is to be cut up and converted into bacon.

"In the northern part of the county of York, the farmers have sold their hogs alive for years, and I think they are much more pleased with that practice than the old process of killing them before taking them to market. They are bought up from them by drovers, and shipped."

And then he draws the following agreeable and appetizing picture of the farm-dressed hog and its fate:—

"The hogs are frozen, and they are taken to the country stores and piled up like cordwood, and gnawed by hogs, dogs, cats, and rats. They are covered with dust and dirt, are pitched about with not much more care than cordwood, are kept in a country warehouse for two or three weeks, sometimes months, and are then brought here by railway, and by the time they reach us, they are more like carrion than human food. If the pigs were killed here, every part of them could be kept bright and fresh and good. I don't know what the drovers pay to the farmers, but we often pay almost as much for live hogs per pound as dressed hogs fetch on the market in the winter."

He says in conclusion:—

"If I could get a steady supply of Canadian hogs from year's end to year's end, even two or three hundred per week, I would be quite willing to give considerably more for them than for American hogs."

GRAIN CROPS.

Wheat.

The complaint that wheat cannot be grown in Ontario so successfully as formerly is a very general one, and the truth of this statement appears to be taken for granted by most people. That it is true in many instances is not to be denied, although the tendency to look back to the "good old times," and to remember what was most agreeable and pleasant, to the exclusion of troubles and drawbacks, is not confined to wheat growers. That, in favourable situations and in good seasons, very large crops were gathered from the virgin soil is indisputable, although whether, with the very rough farming that was in vogue during the first half of this century, a better average was usually obtained than at present, is not so clear. For, while, to-day, many farmers are thankful to get twenty bushels of fall wheat to the acre, there are others to whom from thirty to forty bushels is no rare occurrence. Unfortunately, with the exception of here and there some private record or assistance from the memory of a witness, it is only possible to obtain rough approximate averages of the crops of the Province in the past.

Fall Wheat.

The average yield of fall wheat is now probably a fraction under twenty bushels per acre, and of spring wheat about twelve bushels per acre. But an average of twenty bushels, in view of the very widely differing experiences of farmers even in the same county, owing to local causes or different systems of farming, by no means implies that, on land and in situations well adapted for wheat, and with those improvements and appliances which modern farming, to be successful, requires, now that the merely temporary advantage of a virgin soil is wanting, crops of wheat reaching thirty, thirty-five or even forty bushels may not be raised.

Mr. Drury, for instance, in his evidence, places his highest yield in fourteen years at forty bushels, and his lowest, in a very unfavourable year, at eighteen bushels.

In Kent, where the area devoted to the growth of fall wheat has been largely increased, forty bushels, according to the evidence, is no uncommon yield, while thirty bushels would be an average, and that not with very good farming either. Mr. White says:—

"The average yield of fall wheat for the last three years, leaving out what was sown too late, or on black, mucky land, so that it was frozen, would be about thirty bushels per acre. From what I have seen in travelling about, I think this is as good a wheat-growing county as any in the Province. I would not think that the average yield of fall wheat over the other portions of Ontario would be more than twenty bushels per acre.

"I think our average would be greater if our cultivation was better, and we

did not sow so much land in stubble. I know of cases where proper methods of cultivation brought an average yield of forty to forty-five bushels per acre. Most of my fall wheat is just ploughed over once on stubble or clover sod. I think if wheat is sown on stubble, the land should be ploughed twice, and manured."

Mr. Iler, in the next county—Essex—gives twenty bushels of fall wheat as the ordinary average for the county, but says his own average is about twenty-five bushels, and with proper cultivation he thinks it would be more.

Mr. McCain, also from Essex, gives suggestive evidence on the same point. He says:—

"We do not follow any rotation of crops; *the land is so rich that we just keep cropping away and we all get good crops.* We have sown wheat after wheat.

"I had one piece of sod which I turned up and sowed in wheat, six years in succession. The first crop was a magnificent one, but the crops gradually became less. The reason that I cropped it so often was just that it happened to be convenient. The highest crop that I got off of it was about thirty bushels to the acre, but there was one year when I would have had about fifty bushels had not a storm thrown it down. I only got eighteen bushels to the acre that year. The last year I got fifteen or twenty bushels an acre."

Mr. McCain's experience is not an isolated one. He has "just kept cropping away," wheat after wheat, year after year, and has come down already from thirty bushels to fifteen or twenty, with every prospect of a further reduction if he does not change his method of farming.

Mr. Macfarlane, of Dover (Kent), says:—

"My fall wheat, 1880, averaged 26 bushels to the acre, excluding two or three acres entirely ruined by want of snow last winter."

Mr. John Gibson, of Markham, who farms very systematically, keeps accurate accounts of his several operations and can therefore speak with great exactness, gives forty bushels of wheat as his yield in a seven years' rotation with land well cultivated, moderately manured, and thoroughly drained.

Mr. Andrew Elliott, of Galt, in what he speaks of as a good fall wheat country, gives 23 bushels as his own and others' average for the past four years.

Mr. John Black, of Ramsay (Lanark), says:—

"Originally I grew fall wheat till the country got open. I used to raise from 30 to 35 bushels to the acre, and have raised 40 bushels. I ceased growing it because it was winter-killed. I tried it again about two years ago. Some $5\frac{1}{2}$ acres yielded 40 bushels to the acre. Last year it was again winter-killed. I have no bush to the north or west of my farm to protect the wheat. I attribute the failure of the fall wheat in our section to the absence of protection. Where any has been saved it has been in some sheltered corner."

Mr. Andrew Cochran, also of Ramsay, says:—

"Since 1837 I have grown fall wheat every year but one. The White Flint or Hutchinson has answered best. *While the bush to the north and west was standing, my crop of fall wheat was uniformly successful.* Where other persons' crops were exposed the wheat was injured to some extent. I have raised from 10 to 66 bushels on an acre. The 66 bushels was on one particular acre. The field, $7\frac{1}{2}$

acres, averaged $48\frac{1}{2}$ bushels to the acre. The soil of my farm is a rich clay loam with clay subsoil."

Mr. R. L. Macfarlane, in the same township, but on a soil "partly sandy loam and part clay," gets an average of 25 bushels to the acre.

Mr. Ketcham Graham, of Sidney (Hastings), says :—

"There has been a gradual decline in the yield of fall wheat. I have not grown any fall wheat for twenty years until the last two years. I gave it up twenty years ago on account of the weevil.* Crops in my neighbourhood in 1879 yielded thirty bushels to the acre. This year I have forty-six acres, of which I have ploughed up six, and I expect to have 1,000 bushels from the remainder, though some of it is badly winter killed."

That would be, if the whole forty-six acres be taken into account, just twenty-one and three-quarter bushels per acre on the whole area sown, notwithstanding the winter killing, or twenty-five bushels per acre on the forty acres saved.

As showing however that fluctuations in the fall wheat crop are not of recent experience only, the evidence of another witness, Mr. Walter Riddell, of Cobourg, comes in very opportunely. This gentleman has kept a record for thirty-eight years of the date of his several crop operations, ploughing, sowing, harvesting, and so forth, and also the yield of every crop for that period. He published his reports first in the *Canada Farmer* in 1868, and supplemented them with a further statement at the recent sitting of the Commissioners at Cobourg. As instances of so exact a record are very rare, it may be interesting to see what Mr. Riddell's fall wheat crop has yielded annually in this long period. His figures for fall wheat are as follows :—

	Bushels.		Bushels.
1841	None sown.	1861	None sown.
1842	12	1862	" "
1843	None sown.	1863	" "
1844	" "	1864	" "
1845	" "	1865	" "
1846	" "	1866	" "
1847	12	1867	24
1848	$12\frac{1}{2}$	1868	None sown.
1849	$38\frac{1}{2}$	1869	17
1850	24	1870	$3\frac{1}{2}$
1851	$13\frac{1}{2}$	1871	20
1852	29	1872	18
1853	45	1873	None sown.
1854	16	1874	" "
1855	28	1875	$14\frac{1}{2}$
1856	20	1876	8
1857	24	1877	25
1858	$3\frac{1}{2}$	1878	12
1859	20	1879	None sown.
1860	16		

* The grain weevil, *Calandra Granaria*, although very destructive in Europe is seldom seen in Canada; hence the absence of reference to it by the witnesses examined respecting injurious insects. It is suggested as highly probable that one of the other pests is referred to in the evidence on farming.

The average yield for the twenty-four years in which fall wheat was sown was exactly 19 bushels to the acre, or just about the average of the total yield, so far as estimated at the present time, and although it will be observed that, in the first and second decades of the period, there were some extraordinarily good crops which tend to help the average, it is equally clear there were some very serious failures. But Mr. Riddell adds an explanation to his evidence which seems to account for the difference between some of the crops in the earlier periods and those of the later. He says:—

“The farm on which the crops from 1841 to 1867 inclusive were raised is a first-class farm. The farms on which the rest of the crops since then were grown cannot be said to be more than second-class—this accounts in part for the great falling off in the crops.”

Mr. David Smellie, of Vaughan (York), says:—

“Taking two or three years together I don’t suppose my average would run more than 20 bushels an acre. Excluding this year it would not run as high as 25 bushels. Taking any ordinary three years, I don’t think it would run much more than 20 bushels. Some farmers in my neighbourhood are more successful than I am, as some of the farms near mine are more adapted for wheat, being higher and seeming to do better.

“Fall wheat has been cultivated on my farm forty years, more or less. I remember the time when my crops were a great deal larger than they are at present. I think there is a good deal in the winters to make the crops less now than they were. We have less snow now than we had, and I think that has a great deal to do with it.”

Mr. Cochrane, of Kilsyth (Grey), about eight miles west of Owen Sound, says:—

“Winter wheat has always succeeded well with us, especially on new land; the only exceptions being when it rusted. There always has been a crop of straw, but in some cases there was not a crop of grain on account of the rust. Fall wheat succeeds well in our district. The average yield per acre of winter wheat, where the land is well cultivated, will be, perhaps, 25 bushels. For two or three years back the average has been as much as that, with the exception of last year, when it was winter killed in some places. The Seneca is principally sown at the present time.”

Professor Brown gives 35 bushels per acre as the yield of fall wheat under his system of rotation for the last five years. Yet this average Professor Brown does not consider to be a very successful outcome, the high elevation of the land—900 feet above the level of Lake Ontario—and the exposure of the crop to adverse atmospheric influences in that situation, being he considers unfavourable to the crop.

In giving evidence respecting the use of special fertilizers, Mr. Neil J. Campbell, of Nelson Township (Halton), mentioned 45 bushels as the yield where superphosphate had been applied, and from 25 to 30 bushels as the yield on land when moderately well manured in the ordinary way.

The general conclusions that may be arrived at from this evidence, gathered

as it is from all parts of the Province, both from oral testimony as to individual experience, and township returns, may be stated as follows:—

That the average yield of fall wheat on land under wheat cultivation is—

All over per acre, about..... 19 bushels.

That, where not interfered with by exceptionally unfavourable circumstances, a good average crop is.. 25 “

That, with superior farming on good soil and in favourable seasons, it is not unusual for farmers to raise from ... 30 to 45 “

Why the average is not greater all over, why the larger returns are not oftener obtained, and how they are secured, will be discussed further on.

Spring Wheat.

Meantime, the yield of spring wheat may be noticed. As a rule, the spring wheat crop has been lately in many places an entire and complete failure, and in others has been far from profitable.

The aggregate returns show an average yield of spring wheat of a trifle under twelve bushels to the acre. From witnesses, the following facts in relation to spring wheat were gathered, and may be briefly summarized as under:—

	Bushels.	
Professor Brown, at Guelph, in a seven years' rotation.	17 per acre	
Mr. Douglas, St. Vincent (Grey), Russian White and Red Chaff (1879).....	17 to 18	“
“ Russian White (1880).....	17 to 18	“
“ Red Chaff “	15	“
Mr. Smellie, Vaughan (York).....	15	“
Mr. James Thomson, Brooklin (Ontario)	31	“
Mr. Middleton, Clarke (Durham), average for 18 years, about.....	20	“
Mr. Wm. Noble, Haldimand township (Northumberland).	10	“
Mr. Walter Riddell, Cobourg. For forty years the average has been 32 bushels, but, for the last three years, about.....	13	“
Mr. Ketcham Graham (last year)..... (17 years ago could get 30 to 40 bushels.)	8	“
Mr. R. Macfarlane, Ramsay (Lanark)..... (In 1880 a failure altogether.)	15 to 20	“
Mr. Andrew Cochran, Ramsay—former average.....	30	“
For two or three years.....	5 to 15	“
Mr. James Black, Ramsay—former average.....	30	“
For two years	10	“
Mr. Peter Black, Montague (Lanark)—former av'g.	20 to 25	“
Last two years.....	A failure.	

In Kent and Essex the cultivation of spring wheat has been practically given up. Formerly, it was a good crop of 25 bushels or upwards to the acre, but, to use the words of Mr. Stephen White, it has, of late years, been a failure altogether.

	Bushels.	
Mr. Dickson, Tuckersmith (Huron).....	17 to 23 $\frac{1}{2}$	per acre.
(Generally a failure in his district.)		
Mr. Drury, Crown Hill (Simcoe).....	18 to 20	“
Last year not over....	12 to 14	“

It would be unfair to calculate the average yield of spring wheat upon the basis of the last two or three years' returns, more particularly because the drop has been in many cases so sudden as to indicate some temporary and exceptional cause rather than a gradual decline. At the same time, the information supplied to the commissioners from other sources, indicates results in many cases less favourable than the majority of those above quoted. If the average of the township returns be adopted it will probably represent very fairly the result of the weight of evidence when it gives the average of spring wheat as a fraction under twelve bushels per acre.

The question is not, however, merely, “What is the average yield?” It will be possibly even more interesting to know what may or ought to be the average yield of fall or spring wheat. Nor is it from the facts elicited to be assumed, that so far as Ontario is concerned, there is in this respect any cause for discouragement. On the contrary there is in the intelligent appreciation of existing causes disclosed by witnesses who tell of diminished crops, evidence that gives hope for the future.

Professor Brown in his evidence says :—

“I am of opinion that the yield of wheat is steadily on the increase in the older portions of the Province, largely by reason of more root growing and cattle raising.”

Professor Buckland, a life-long student of everything affecting agriculture, and a most careful observer, after alluding to the probable competition arising from the vast production of grain crops in the North-West, says :—

“Our soil and climate are alike suited to the raising of grain and pasturing on a large scale, and it has been found all over the world, that wherever the conditions are at all suitable, the mixed system of husbandry, viz., the growing of grain and the breeding of stock, is the most certain and profitable. It keeps up the stamina of the soil, and I have long been of the opinion that it would be wise for the Ontario farmer to cultivate less land for grain, and to use the remainder for the purpose of pasturing cattle and sheep.”

This process is most undoubtedly going on—and with what result? Not perhaps in the sowing of a larger or much larger area of wheat, but in an improving yield of wheat wherever a skilful and intelligent combination of favourable operations is effected. The primitive system of husbandry incidental to a newly settled country was, it is now admitted by everybody, a wasteful one, and the land has

not yet had time to recover from it. The Reciprocity Treaty with the United States gave too brief an opportunity to the recuperating influences it tended to encourage. With its termination there came a temporary reaction. But the evil resulting from the abrogation of the treaty was not without its compensations. The check then experienced, made efforts in other directions necessary, and the rapid development of dairy farming under the demands of the great cheese manufacturing industry was the first step in a right direction. That industry, however, is but fifteen or sixteen years old, and the trade in sheep and cattle with Great Britain, now growing rapidly to large proportions, did not exist at all until within a third of that period. And there is an evident consciousness among the witnesses, that, to no inherent deficiencies of soil or climate, but only through the absence of agencies that capital and intelligence may supply, is failure or a low average very often to be ascribed. The country is, in fact, in a transition state, with a tendency every day growing stronger towards better farming, better crops, and, consequently, better times. The existing defects will be referred to presently.

Cost of Growing Wheat.

The question “What is the cost of raising an acre of wheat (fall or spring)?” appeared to have been presented for the first time to a great many of the witnesses. The answers in not a few instances when given orally were arrived at only after some discussion and much consideration. When rendered in reply to a printed form, the answers differ widely, ranging from \$7 to \$8 in some cases to \$20 and \$21, in others the average of the replies from two hundred and twelve farmers being \$12.18 for fall, and \$11.17 for spring wheat. In the case of spring wheat the calculation is less difficult than in that of fall wheat, inasmuch as, in regard to the latter, it is often embarrassed by the intervention of a summer fallow, and, by the very close approximation of the estimates for fall and spring wheat respectively in the written replies, it may be feared that the informants have not generally included all that should be included in the cost of a fall wheat crop.

The following are some of the replies from witnesses already mentioned who were orally examined as to the cost of growing fall wheat. The value of each estimate will be more easily appreciated if the details are given:—

Mr. Drury, County of Simcoe (on a first-class fallow):—

Interest on value of land	\$3 00
Preparation of land for crop (including cost of fallow).....	9 00
Seed.....	1 50
Sowing and harvesting.....	2 00
Threshing	1 60
Manure	4 00
	<hr/>
	\$21 10

Mr. Drury says in relation to this estimate :—

“I include the labour in the estimate. In the preparation of the farm for the crop, I charge a first-class summer fallow, although it is scarcely fair to charge the whole fallow to the wheat, because the effect of that fallow is seen in the four succeeding crops ; but I have not put it at a high figure, because we should have four ploughings and sixteen harrowings.”

Without having actually made an estimate, Mr. Dickson (Huron) is disposed to think Mr. Drury's calculation 20 per cent. higher than he (Mr. Dickson) would put it.

Mr. S. White, Kent, (on clover sod or stubble) :—

Rent, or interest, and taxes	\$5 00
Preparing land for crop.....	3 50
Seed	2 00
Sowing and harvesting	2 50
Threshing.....	2 00
Marketing.....	1 00
	<hr/>
	\$16 00

Mr. Iler, Essex, (on clover sod, stubble or corn ground) :—

Interest or rent.....	\$2 50
Preparation of land.....	2 00
Seed.....	1 50
Sowing and harvesting	2 00
Threshing.....	2 00
Other charges.....	1 00
	<hr/>
	\$11 00

Mr. McCain, Essex, (generally on oat or pea stubble) :—

Interest or rent	\$3 00
Preparation of land for crop.....	2 50
Seed.....	1 50
Drilling and harvesting.....	2 00
Threshing	2 80
Marketing	1 00
	<hr/>
	\$12 80

Mr. Riddell, Northumberland, (on pea stubble) :—

Interest or rent ..	\$3 00
Preparation of land	4 00
Seed.....	1 50
Sowing, harvesting and housing.....	2 25
Threshing	0 55
Rolling, cleaning, etc.....	0 50
	<hr/>
	\$11 80

Or, on summer fallow, say ... 16 00

Mr. Riddell adds :—

“Manure is occasionally put on, but it could not be charged to one year's crop. Its cost would be, perhaps, from \$2 to \$3 per acre.”

Mr. Andrew Elliott, of Galt, a very thoughtful witness, handed in the following as his estimate :—

Estimate of Cost and Returns of Fall Wheat Crop.

No. 1.

The following estimate of cost and income derived from wheat crop is taken from the crop of 1878, on a barley stubble—barley after clover :—

Rent of land (10 acres).....	\$50 00
Ploughing with three horses, six days	18 00
Harrowing twice over.....	2 50
Gang-ploughing, two days.....	5 00
Harrowing twice and sowing with drill	5 00
Plaster and salt applying	5 00
Reaping and binding.....	10 00
Threshing and marketing.....	20 00
Seed—13 bushels at \$1.25	16 25
	<hr/>
	\$131 75

The crop realized the following figures :—

Marketable grain, 330 bushels (an extra crop), sold for 95 cents	\$313 50
Straw bedding	10 00
Chaff feed.....	5 00
	<hr/>
	\$328 50
Less cost	131 75
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Profit.....	\$196 75

No. 2.

The following is taken from the crop of 1879, from a yield which had been cut for hay for two years, an orchard grass sod, ploughed as soon after the hay was removed as possible, all before the 10th of July :—

Rent—14 acres at \$5 per acre.....	\$70 00
Ploughing—three horses, ten days	30 00
Harrowing and cross-harrowing	6 00
Gang-ploughing, three days.....	7 50
Sowing and harrowing, three days	7 50
Seed, 21 bushels, at \$1.....	21 00
Reaping, binding, and hauling.....	32 00
Marketing and threshing	20 00
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Cost	\$194 00

Crop realizing 330 bushels wheat, at \$1.20	\$396 00
Straw and chaff	20 00
	<hr/>
	\$416 00
Less cost	194 00
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Profit	\$222 00

These estimates are made on the calculation that only one year's rent is chargeable, as the land produced a crop the previous year, a summer fallow being thus avoided.

This statement has the appearance of great exactness but it is defective in omitting to charge for manure of any kind in the second table and charging only for salt and plaster in the first ; for, whether applied in the particular year represented in the statement or not, it is not to be supposed so good a farmer left his farm without manure, or could realize 33 bushels an acre, even in an exceptionally good season, without the help barn-yard manure would afford.

The necessity for a due apportionment of charges on fallow, cultivation, or manuring, to the several crops grown on the same land is even more apparent when the history of a whole rotation has been given.

Mr. John Gibson, of Markham, who keeps very exact accounts of all his operations, gave the Commissioners a most interesting statement of his experiences and described his system of rotation and its financial results. His farm, it may be mentioned, as shown by the crops obtained, is in a high state of cultivation, the result of several years of steady and thorough improvement, including complete under-draining. For purposes of rotation the farm is divided into ten-acre fields. The following are his figures :—

Statement of Rotation and Financial Results.

The following statements will show the expenditure on each crop of the rotation, the income derived therefrom, and the net profits, during the eight years of the rotation, on a ten-acre field :—

First and second years—Summer fallow and fall wheat.

EXPENDITURES—Ploughing five times, once with three horses.....	\$96 00
Harrowing, five times.....	13 00
Grubber, three times, once with four horses.....	11 00
Manure, 105 loads, at \$1 per load.....	105 00
“ cost of drawing.....	18 00
Spreading the manure.....	2 00
Salt, five barrels.....	5 00
Seed, 20 bushels, at \$1.25.....	25 00

Sowing and working.. .. .	\$ 2 00	
Harvesting, threshing and marketing.....	50 00	
Rent for two years, at \$5 per acre.....	100 00	
Total expenditure.....	—	\$427 00
RECEIPTS—400 bushels of wheat, at \$1.25 per bushel...	500 00	
10 tons of straw, at \$3 per ton.....	30 00	
	—	530 00
Balance of profit.....		\$103 00

Third year—barley.

EXPENDITURES—Fall ploughing, six days.....	\$18 00	
Cultivating in the spring, and sowing.....	7 00	
Seed, 20 bushels, at 65 cents.....	13 00	
Harvesting and marketing.....	40 00	
Rent of land.....	50 00	
Total expenditure.....	—	128 00
RECEIPTS—450 bushels of barley, at 60 cents.....	270 00	
10 tons of straw, at \$2 per ton.....	20 00	
	—	290 00
Balance of profit.....		\$162 00

Fourth, fifth and sixth years—Grass.

EXPENDITURES—Seed.....	\$7 00	
Harvesting, at \$1 per acre.....	30 00	
Marketing, three crops, 60 tons, at \$3 per ton.....	180 00	
Rent of land.....	150 00	
Total expenditure.....	—	367 00
RECEIPTS—60 tons of hay, at \$11 per ton.. .. .	660 00	
	—	660 00
Balance of profit.....		\$293 00

Seventh year—Peas.

EXPENDITURES—One ploughing.....	\$18 00	
Cultivation and sowing.....	7 00	
Seed, 20 bushels, at 80 cents.....	16 00	
Reaping and threshing.....	10 00	
Marketing.....	12 50	
Rent of land.....	50 00	
Total expenditure.....	—	113 50
RECEIPTS—250 bushels of peas, at 60 cents.....	150 00	
10 tons of pea straw, at \$4 per ton.....	40 00	
	—	190 00
Balance of profit.....		\$76 50

Eighth year—Oats.

EXPENDITURES—Preparation of land, including cultivation	\$25 00	
Seed, 25 bushels, at 42 cents per bushel.....	10 50	
Reaping and threshing.....	22 50	
Marketing.....	27 00	
Rent of land.....	50 00	
Total expenditure.....		\$135 00
RECEIPTS—750 bushels of oats, at 42 cents per bushel....	315 00	
15 tons of oat straw, at \$4 per ton.....	60 00	
		375 00
Balance of profit.....		\$240 00

The following is a summary of eight years' operations :—

	<i>Receipts.</i>	<i>Expenses.</i>	<i>Profits.</i>
First and second years—fallow and wheat	\$530 00	\$427 00	\$103 00
Third year—barley.....	290 00	128 00	162 00
Fourth, fifth, and sixth years—grass.....	660 00	367 00	293 00
Seventh year—peas.	190 00	113 50	76 50
Eighth year—oats.....	375 00	135 00	240 00
Totals.....	\$2045 00	\$1170 60	\$874 50

That is a profit from ten acres in eight years of \$874.50, or \$10.93 per acre per year.

However satisfactory this statement as a whole may be, as an exhibit of successful operations, it is evident that the particular calculation as to the cost of fall wheat-growing, would, if accepted by itself, be most unfair to that cereal. For it includes (1) the cost of the land for two years instead of one; (2) all the cultivation of the fallow; and (3) all the manure required for the whole rotation.

As the account stands the wheat was raised at an apparent cost of over \$42 per acre, yielding 400 bushels of wheat at a cost of \$427, or rather more than \$1.06 per bushel, and except that, being a fine sample, it was sold for seed it would probably, notwithstanding the heavy crop, have been only marketable at a loss. The actual profit shown is \$103 on the ten acres; but, for a crop of forty bushels to the acre of seed wheat, \$10.03 per acre would be a very poor return indeed. It is clear that from Mr. Gibson's figures, useful and instructive as they are in many respects, it will not do to take the cost of raising an acre of wheat, although they may help to an approximation.

The average cost of an acre of wheat, as stated by the witnesses just mentioned, is \$14.86, or some \$2.70 more than the average of the written replies. This is owing probably to the fact that the witnesses examined were generally men of rather liberal views and ideas, and who gave, as a rule, the results of their own personal experience, while the written replies represent local averages in most instances. Besides, it was observable that a tendency to omit some charge

or other was, on a first calculation, not infrequent, although on reconsideration the omission was supplied.

With the most thorough cultivation, with the most liberal use of manure, including salt, gypsum, bone-dust and phosphate, Professor Brown, in a rotation, charges the wheat crop with a cost of \$20.85 per acre, but this, for reasons stated by the Professor, does not include any charge for rental or interest of money. Charging interest on value of land or rental, all the labour, and the manure, it is probable that the cost of raising an acre of fall wheat, by what passes generally as fairly good farming, is from \$15 to \$16 per acre, and of spring wheat from \$13 to \$14 per acre. That, if charged against the average yield, in either case would show, as regards fall wheat, reckoning a dollar as the average value, a net profit of \$5 per acre, and on spring wheat a loss of from \$1 to \$2 per acre, allowing nothing in either case for the straw—to which Mr. Gibson attaches a value of \$3 per ton; Mr. Andrew Elliott appraises (including chaff) at \$1.50 per acre; while Professor Brown puts it down at \$5 per ton, a price it would probably command in his section.

Many farmers, however, insist that straw is of no appreciable money value and so leave it out of the account altogether, or mentally balance it off against manure, which they place in the same category. It is obvious, however, that by no such inexact methods can true results be reached, and that the money value of a thing may be found, not in what it will bring in the open market, but in what it will produce by being—not sold but—utilized on the spot. Leaving out, for the moment, the question of spring wheat decline, which, as already remarked, appears to be attributable to exceptional causes, it must also be remarked that, where from \$15 to \$16 per acre is expended judiciously and systematically in fall wheat culture, it would be most unfair to assume that only the low (all over) average of nineteen to twenty bushels per acre is harvested. For, if the highest returns are not ordinarily obtained at that outlay, it is, doubtless, the men who do thus systematically and judiciously expend such a sum per acre who are familiar with a yield of twenty-three bushels, twenty-five bushels, twenty-six bushels, or even more per acre.

Method of Wheat Cultivation.

As wheat is a crop of so much importance, and as difficulties attend its cultivation to which other cereals are not exposed, it may be desirable before alluding to the latter to notice the general method pursued in connection with wheat cropping in Ontario, and to ascertain, if possible, what defects require to be remedied, in order to increase the yield. Fall wheat may be first considered. In Simcoe, according to Mr. Drury, about one-third of the fall wheat is sown on pea stubble, and about two-thirds on fallow after an oat crop. The system of drilling is as yet

only partially followed, but where it is adopted Mr. Drury notices "the wheat came through winter in a better condition than that which was sown broadcast." The Hessian fly has done a little damage to both fall and spring wheat, but principally to the latter. Mr. Drury goes on to say :—

"The clearing of the land of forests has undoubtedly made a difference in the growth of fall wheat. I have a field sown with fall wheat sheltered on two sides by a wood, and I venture to say that it is as fine a field of wheat as can be found anywhere in the whole Province. I attribute this solely to the protection from storm and wind afforded by the surrounding bush. Such a protection is especially valuable during a season like last winter, when we had very little snow on the ground."

It is evident that, with improved farming, the injury from forest clearing has been partially counterbalanced, for Mr. Drury goes on to say :—

"So far as my knowledge extends the yield of fall wheat averages now as much per acre as it did fourteen years ago, or when the land was first broken up. This result has been largely attained by the practice of making a good fallow, putting the manure of the year on that fallow, and sowing it with fall wheat. The average yield of fall wheat in my district has been twenty-five bushels to the acre."

But there is one very essential duty to which the agriculturists of that section pay too little attention. Mr. Drury says :—

"From my observation, I find large quantities of the finest land we have in the country are wet lands, with a good clay subsoil; and I think if that land were drained, it would rank at once as the best land in the country. All these wet lands could be reclaimed and utilized at a very moderate expenditure for under-draining them. I think it would pay so well that, if my farm needed draining, and I had to borrow money at ten per cent. and mortgage my farm to get it drained, I would do it."

The people of the section Mr. Drury represents have a good soil, they have also among them some good farmers of whom Mr. Drury is an excellent specimen, but they are every year risking the loss of their crop for want of shelter, and neglecting the most vital of all the conditions of success when they omit to under-drain their lands. Nor are these their only defects.

"There are farmers in my district," says Mr. Drury, "who sell every bushel of grain they raise, except a few bushels to feed their horses on, all the hay they have got except what they must keep, and all their straw. They won't bring anything on the land, they keep two or three old scrub horses and cattle, and they will not put forty loads of manure on their whole farm."

Now this is in a district where, Mr. Drury says, the average yield of fall wheat is twenty-five bushels to the acre. What in such a district might not be done with replanting, in the place of clearings, to protect the crops, and a thorough system of under-draining and attention to the raising of well-bred stock, with all the recuperating results that implies.

Mr. Drury's rotation is as follows :—

"After breaking up a sod first sow oats, let that be followed by roots or fallow, then sow wheat, then peas, then barley, oats, or spring wheat, and then seed down with whatever may be required according to the circumstances. Many

complain of an increasing difficulty in getting the seed to catch. I think that is owing to the soil becoming less fertile every year. Wheat and barley will grow about the same after a root crop; if you were seeding down in a field that had either peas or roots in the previous year, I don't think you would find much difference."

Mr. White, of Charing Cross (Kent), says of his section :—

"Fall wheat growing in Kent is a very profitable branch of the farmer's industry, and I think it can be made more profitable by proper farming. The departure of the weevil is not peculiar to Kent; I think it is pretty general. We have had no particular trouble with our fall wheat for the last few years. The Hessian fly has not troubled us. We have tried every variety of spring wheat that we could hear of, but none of them succeeded. We have not tried the White Russian spring wheat. We are gradually clearing away our natural forest protection.

"The breadth of fall wheat sown has increased very much. I think the only effect of the removal of the forest was in taking away the shelter which kept the snow on the wheat, and prevented the blast from driving over the fields in full force. If the wheat here gets through the winter we have no trouble with it. Some of the most beautiful fields of wheat I ever saw were sheltered by dense forest, and it matured well.

"Clover sod, turned over, has lately been used to some extent as a seed-bed for fall wheat, and it has done very well. I turned over fourteen acres last year, and as it was very dry, I was a little afraid of it, but it turned out a fine field of wheat. It was just ploughed over once. In this part of the country there is very little summer fallowing. The fall wheat is chiefly grown on stubble land, or clover turned over.

"I think our average would be greater if our cultivation was better, and we did not sow so much land on stubble. I know of cases where proper methods of cultivation brought an average yield of 40 to 45 bushels per acre. Most of my fall wheat is just ploughed over once on stubble or clover sod. I think if wheat is sown on stubble, the land should be ploughed twice, and manured."

Mr. White adds :—

"There is very little under-draining done in this county. There is some along the river, and it seems to have had a good effect upon the land."

The average yield in this county is high, but it is evident the farmers are doing their best to make it less. "If the wheat gets through the winter," says Mr. White, "we have no trouble with it." If it does not get through the winter, it is because the forests needed to retain the snow and shelter the plant are no longer standing to protect it. In Kent some tree planting is going on, but clearly to no such extent as would be desirable. In the next place, the perpetual raising crop after crop on sod must have a steadily exhausting effect, unless the manuring be much more liberal than is usually the case.

"There is no doubt," says Mr. White, "that, in other portions of Canada, the soil was, at one time, as rich as ours, but it has become exhausted through neglecting its restoration. *A large portion of our country requires attention now before the land has become too much exhausted.*"

In Kent, the history of other counties is simply repeating itself.

"The reason," Mr. White continues, "why so little attention has been paid to the rotation of crops, is that our land is so rich people do not see the necessity of it. In future, no doubt, they will have to pay more attention to the subject. I think even at present they should begin to farm systematically."

If they don't want to suffer the fate that has befallen too many others, they will adopt a regular rotation, which is now almost wholly neglected, plant two trees for every one they cut down, and under-drain their farms. With a most favourable climate and soil of great fertility, even their comparatively excellent average yield might be largely increased.

In Essex, fall wheat cultivation is also successful, although the averages are less. Mr. McCain's candid admission, "We just keep cropping away," has been already noticed. He says further:—

"We generally turn over sod and put in corn and wheat. Good crops of both fall and spring wheat have been raised in that way. Sometimes the fire runs over the sod and burns it off, and then we sow it without ploughing at all.

"We do not follow any rotation of crops; the land is so rich that we just keep cropping away, and all get good crops.

"We have sown wheat after wheat. I had one piece of sod which I turned up and sowed in wheat, six years in succession. *The first crop was a magnificent one, but the crops gradually became less.* The reason I cropped it so often was just that it happened to be convenient. The highest crop that I got off it was about thirty bushels to the acre, but there was one year when I would have had about fifty bushels had not a storm thrown it down. I only got eighteen bushels to the acre that year. The last year I got fifteen or twenty bushels an acre.

"There are not many who are cropping their lands in that way. Generally speaking, farmers are becoming alive to the necessity of keeping up the soil, as they find that their land is deteriorating. The system which they are now generally adopting is turning over clover. We generally cut two crops of clover, the first for hay, and the second for seed. Then we turn it over and generally sow wheat. Clover sod does not answer very well with us for corn. Turning over the clover sod enriches the soil and makes the clay loose. It also improves the sub-soil, and the clover draws its nutriment from below the surface soil."

It is highly satisfactory to be assured by Mr. McCain that "cropping away" wheat after wheat, is not the universal practice in his neighbourhood, and that a drop from thirty bushels to fifteen or twenty is not regarded as a proof of good farming. "But, as the farmers," he goes on to say, "burn their straw," using only the ashes as manure, in preference to bedding their hogs (which they raise in large numbers) with it, and so providing a supply of the richest manure known, it may be inferred the maximum of fall wheat growing possibilities has not yet been reached in that section.

What may be done by skill and energy, with far less advantages than some of the persons just referred to are throwing away, was shewn by the evidence of Mr. T. L. Pardo, of Buckhorn, in Kent. When Mr. Pardo took

to the farm it was run down and exhausted. His wheat crop at first was even ludicrously small. He, too, sows wheat on clover, but does not depend on clover of itself to fertilize the land. He says:—

“I always sow clover on all wheat lands early in spring, which makes excellent pasture in the fall after the wheat has been cut. After cutting the first crop next season for hay, I plough the second crop under and sow wheat, which nearly always proves a good crop when sown after clover. In fact I consider it the very best fertilizer we have, and every farmer who sows clover largely must soon bring his farm up to a high state of cultivation.”

But he adds:—

“I keep about 30 head of horned cattle on my farm, consisting of milch cows and young stock under two years old. I also buy a number of two and three-year old steers to stall-feed in winter. The past winter I fed 24 head of steers, which I found to pay me well for my grain, besides the benefit which all farmers must derive from feeding all coarse grains, hay or straw, upon the farm, instead of teaming such away to market.”

He has also the benefit of a very large quantity of manure, and by these means *his once impoverished farm yielded him, last year, 35½ bushels of fall wheat to the acre.*

Attention has already been directed to the system of farming pursued by Mr. Gibson, of Markham. How he comes to grow 40 bushels of wheat to the acre is easily explained. He says:—

“When I first went upon my farm it was a rather peculiar one. It was wet, but not springy. There were no springs upon it, but it was full of frog ponds, and altogether a low, wet farm, not at all adapted for raising fall wheat. I made up my mind that I would make it a good farm if possible, fit for any kind of crop, although at that time it was almost in a state of nature, new and full of stumps. I commenced upon a hundred acres, and I laid out a plan, roughly indicating what I intended to do.

“From 1847 to 1860 I was engaged in preparing the land for the rotation, and the rotation I decided upon was a seven years' rotation. (The witness here produced a plan of his farm, showing the location of the drains, and the rotation of crops which he had pursued to the present time.) My farm, for the purposes of rotation, is divided into ten-acre fields. When I got the land into good condition for beginning the rotation, I commenced with a summer fallow, and it had a beneficial effect on every crop in the rotation. After the summer fallow came fall wheat; then barley; then three years of grass, seeded down; then peas; and then oats. There are two years included in the summer fallow. That is the system of rotation which I have carried out since 1860.”

Mr. Gibson adds:—

“Before I made the improvements on my farm, it was not worth more than \$3.00 per acre. *The difference is represented chiefly by under-drainage.* This rotation keeps the land perfectly clean.

“Before I drained my land it was hardly of any use for me to sow fall wheat in it. The highest average was from sixteen to twenty bushels to the acre; and when the midge came round a great many of my neighbours gave up growing fall wheat altogether. But after I had drained my farm I had almost **always** good crops of fall wheat, during the time that the midge was at the worst.”

If anything strikes the reader as less than entirely satisfactory in Mr. Gibson's operations, it is an apparent deficiency of stock leading to a sparse allowance of manure,—only ten loads per acre in (the fallow included) an eight years' rotation,—and the necessity for marketing his crops at a place fifteen or sixteen miles from his place of residence. Barley, peas, oats and hay are all drawn to market at a cost of some three dollars per ton, and at a large loss of manure the farm would well bear. The farm is admirably under-drained, and intelligently cropped, but, if Mr. Gibson would be as liberal with his manuring as he has been with his draining, and, instead of wearily teaming his crops to Toronto, send them all, in beef or mutton, on four legs to the nearest railway station for shipment, minus a large portion of their value left on the land, his exhibit would be far more gratifying than it is at present. In fact, the profit realized is hardly commensurate with the expectations excited. From some remarks, in Mr. Gibson's evidence, he appears to be more or less inclined to adopt the views just suggested.

Mr. James Black (Lanark) had the following to relate. He said :—

“Originally I grew fall wheat till the country got open. I used to raise from 30 to 35 bushels to the acre, and have raised 40 bushels. I ceased growing it because it was winter-killed. I tried it again about two years ago. Some 5½ acres yielded 40 bushels to the acre. Last year it was again winter-killed. I have no bush to the north or west of my farm to protect the wheat. I attribute the failure of the fall wheat in our section to the absence of protection. Where any has been saved it has been in some sheltered corner. The fall wheat when I grew it formerly was retarded by the seasons and want of protection, and the weevil and other enemies got into it. This was seventeen or eighteen years ago. My land is mostly flat and low.”

The yield of wheat, when it escaped winter-killing, without apparently any special effort, is accounted for by the next item of information given by the witness. He says :—

“I have under-drained a good deal with tile, stone, and wood. I prefer tile. The effect of under-draining on the wheat, especially the Fife, was very good. I think draining is profitable. My farm was little good until it was drained. My success with wheat formerly was on the higher and drier portions of the farm. The lower portions were entirely useless until they were under-drained. After draining, the lower portions were the most profitable.”

Mr. Black, it will be seen, is no niggardly agriculturist. His farm, assisted by under-draining, is ready to respond to his liberality, but his wheat suffers just as the farmer would himself suffer, no matter how healthy and vigorous, if deprived of warmth and the shelter necessary to existence in the winter season. He has done everything to cause the crop to grow, but has done nothing so far to keep it alive when it would grow. A good thick shelter belt of spruces where the original bush leaves his fields exposed to the north and west would give him in a few years the protection needed and now obtained only in chance corners or sheltered spots.

Mr. Andrew Cochran, of Lanark, has also under-drained largely. He follows a system of rotation, uses fertilizers, and grows large crops of roots and coarse grains. His usual rotation he describes as follows :—

“As a rotation when I break up grass land I sow peas, then manure, and sow spring wheat; we either seed down with the wheat or follow the wheat with oats and seed down. We keep it in grass two to three years, and cut from 1 to 2 tons to the acre, say $1\frac{1}{2}$ on an average. We keep the land in pasture then for about three years. It then needs renewal.”

But now as to Mr. Cochran's fall wheat crops. He says :—

“I give my attention chiefly to grain growing. I grow all kinds of grain except rye and buckwheat. Since 1837 I have grown fall wheat every year but one. The White Flint or Hutchinson has answered best. While the bush to the north and west was standing, my crop of fall wheat was uniformly successful. Where other persons' crops were exposed the wheat was injured to some extent. I have raised from 10 to 66 bushels on an acre. The 66 bushels was on one particular acre. The field, $7\frac{1}{2}$ acres, averaged $48\frac{1}{2}$ bushels to the acre. The soil of my farm is a rich clay loam with clay subsoil.

“I had left the bush to the north and west the whole length of the lot an acre wide, but a strip four acres long was burned recently, and it has rendered 100 acres much less productive. The fall wheat blows bare and freezes out. I sowed nine acres last year and just got four stooks. I invariably lose the crop when I sow opposite the burned opening.”

Mr. Cochran is not to be blamed because his wheat is killed for he very wisely provided for its protection. But what is accidental in his case illustrates most forcibly the condition of numbers who, on good farms and with every opportunity for success, neglect some one thing without which all the others may be useless.

Mr. Macfarlane, another Lanark farmer, has a different story to tell He says :—

“I grow both fall and spring wheat. I have averaged about 35 bushels to the acre of fall wheat, and 15 to 20 bushels of spring wheat, but this year both have been a failure, and last year I sowed no spring wheat. In that year the fall wheat did well, producing a full average. My farm contains a variety of soils; part is light sandy loam and part clay. I have grown wheat on both soils.

“On the fall wheat last year in one field, I followed peas without manure, and in the other peas with manure. The difference was very marked, not less than eight bushels to the acre in favour of the manured lot. We put twenty wagon loads of manure to the acre.

“I regard the failure of the fall wheat this year as due to a new blight. The wheat lost in colour early in the fall, before the winter set in, or any severe frost occurred. It never recovered, and did not grow. In the spring it was all gone. I could not find any insect pest at work.”

It appears to the Commissioners that an event of the kind mentioned was worthy of more attention than the melancholy gaze of the bereaved farmer at the fast vanishing vegetation. If the secretaries of township agricultural societies would charge themselves with some care and interest in such matters,

and communicate with the Entomological Society or the Department of Agriculture or endeavour to ascertain the true cause of a catastrophe of this kind, it would be better than to leave the event to come and go and perchance be forgotten until its recurrence.

Mr. Riddell, of Cobourg, has already been mentioned as a wheat grower, and as keeping a record of his past forty years' experiences. He says respecting fall wheat :—

"Fall wheat does very well if we can get it through the winter safely. I believe the winter-killing is largely due to the land having been denuded of forest. Where the land is sheltered on the north and west there is almost always a good crop."

Mr. Noble, of Haldimand Township, says in the same connection :—

"Twenty years ago, fall wheat yielded thirty-seven bushels to the acre. Last year, Clawson wheat yielded me only twenty-four bushels per acre, and that on the choice field of the farm. I do not think it is safe to grow fall wheat unless the fields are well sheltered."

Mr. Riddell has been farming as well as calculating and recording his experiences for forty years. Mr. Noble owns two farms in as many townships of, altogether, 670 acres in extent—430 in one place and 240 in the other. Is it too much to expect of men so able and intelligent that they will make fall wheat growing a possibility, and set a good example to others, by providing a new shelter in place of the old one destroyed?

Mr. H. Middleton, of Clarke, Durham, has just the same experience. He says :—

"I do not raise much fall wheat, and it is cultivated only to a limited extent in this district of late years, owing to its liability to winter-killing. We tried spring wheat at first as a substitute, but of late years we have been raising barley. The failure of the fall wheat had been pretty general.

"Eighteen or twenty years ago, *before the forest had been all removed*, it was a successful crop. I have made no attempt to renew its cultivation until last year, and the attempt was a failure, owing to the crop having been winter killed."

If, as the forest was cleared, either shelter belts had been left or new trees planted, Mr. Middleton—who under-drains, manures tolerably well, and endeavours to meet the special requirements of the soil with fertilizing agents—had only planted more trees, he might have been growing good crops of fall wheat to this day. Nor is it too late even now to make the experiment.

Mr. David Smellie, of Vaughan (York), says of the wheat crop :—

"Fall wheat has been cultivated on my farm forty years, more or less. I remember the time when my crops were a great deal larger than they are at present. I think there is a good deal in the winters to make the crops less now than

they were. We have less snow now than we had, and I think that has a great deal to do with it.

“The country is getting more cleared of timber, and that is another thing to account for the diminution in the crops. The more bush and shelter the greater the crop of wheat. There is no doubt that a sheltered field will produce more grain than one exposed. A field of mine that is sheltered by a piece of bush, I have observed never fails at all, or at least never so much as the others.”

Mr. Smellie is an advocate for, and carries out under-draining. He also adopts a rotation which he describes as follows :—

“My rotation is something as follows : First year, summer fallow ; next year, fall wheat—seed down with timothy, and let it lie three years in grass ; then peas on the sod, and probably fall wheat on the peas. This would be the rotation I would follow if the crops would be successful, but sometimes you hardly know what to sow if the crops have been a failure.”

He manures as freely as his supply of manure will allow. He fights the thistles with hearty good will, and success. He has protected his orchards with Norway spruce shelter belts, and gone extensively into ornamental tree-planting. Only the expense appears to deter him from planting shelter belts to protect his grain fields. Till that is done it is to be feared the fall wheat crop will still be, comparatively, at least, a failure.

Mr. John Douglas, of St. Vincent, Grey, has a different experience to relate from that of some persons. He says :—

“The reason that fall wheat was not grown so extensively was, that it was very apt to get winter killed, until the last few winters, when it has stood very well. It stands the winters better now than it did ten years ago. As the country is more cleared now there is not such a heavy fall of snow now as there was then, it being the heavy snow that killed it.

“The people in my neighbourhood have not been draining their lands to any great extent. I have drained some of mine. Nor is there more shelter this year than formerly. People tried fall wheat some years ago, but it was liable to get winter killed. When it stood the winter it was a fair crop. I tried it myself, but without success. The Clawson variety of fall wheat is the kind principally sown in the neighbourhood. I think the older land is more suitable for fall wheat ; when we were clearing the new land it was given to rust. I suppose the better cultivation now-a-days has something to do with fall wheat being grown more successfully now than it was. I am about seven miles from the Georgian Bay in a straight line from it. I don't know if the lake would have any influence in the growing of fall wheat. There was very little fall wheat winter killed this last year in our district.”

The statement made by Mr. Douglas has been made by others. It is not, however, so clear that the fall of snow was the cause of the wheat perishing. Wheat needs air and light as well as shelter, and is peculiarly sensitive to the effect of cultivation. The shelter for all practical purposes probably remains in most cases still sufficient to protect the crop, while the clearings are larger, and the cultivation, sowing, and other incidentals to successful wheat-growing are all now in its favour. But the day will come, if the shelter is not preserved, or gradually re-

placed by a new growth, when the value of "more clearing" will not be so highly appreciated as it is at present. Mr. Douglas, however, is sensible of the importance of tree shelter. He says :—

"Although I have quite a bit of shelter on my farm it is not in very good shape. I fully appreciate the value of shelter on a farm, and I think it would be a great advantage to the country if we had more shelter than we have. On the north side of my farm I have a natural strip of wood that happened to grow up where the fence stood, and now there is a very nice row of trees part way along the fence. They have grown up without cultivation. I am in need of more shelter on my farm, and I think the crops would be a great deal better with it. Some of the farmers in my neighbourhood are beginning to find out the want of shade trees on their farms. I think they would plant trees and take care of them if the trees were given to them for nothing."

It is not difficult, with the examples afforded by the evidence, to discover, pretty nearly, in what the short-comings of the wheat-growers of Ontario consist. No doubt there are a large number who, like the witness from Essex, are "cropping away," wheat after wheat, and every year being content to get less wheat because it happens to be "convenient" to sow it. But the Commissioners believe that a very considerable proportion of the farmers of Ontario do endeavour, as far as they can, to carry out something like a systematic rotation of crops, while others are, perhaps, almost unconsciously, falling into a similar plan or practice. There is evidence, too, that, by the help of the dairying industry, and the demand for fat cattle, more barn-yard manure is being made and applied to the land, although still often in insufficient quantities, and that the application of artificial fertilizers is becoming more common. The use of the drill, and other mechanical appliances, is also very general, leading to a better method of cultivation, and the various operations preliminary to the growth of the crop. More slowly, but still making progress, is the under-draining of farms. Forest shelter for the wheat crops is becoming more appreciated, and while clearing is still going on in many places, and replanting for shelter purposes has hardly begun anywhere, still farmers are becoming more careful of their remaining bush and asking how they may replace what has been lost.

Something Wanting.

But the weak point even among the most intelligent is a *want of finish*. Just as Canadian butter is disadvantaged by good and bad being packed in one tub; just as Canadian apples are cheapened by careless packing; just as Canadian salt has been discredited—although of unchallenged purity—by want of drying; so is the fall wheat crop frequently lost or injured because some one thing needful is neglected. In one case there is a too sparing use of manures; in another, under-draining is omitted; in another, where everything else is attended to, the crop perishes for lack of shelter. Too often in this way, after much expenditure of

labour and capital, is the homely adage of Mr. Hall, of Liverpool, about "putting in at the spigot and letting it run out at the bung-hole," found to apply to others than Canadian shippers of stock. The man who leaves one essential to the production of a good crop wanting, where every one is vital, is as wise as he, who to protect himself from robbers goes to bed with every means of access barred and bolted except his front door. The want of vigorous nourishment and good cultivation which leaves the plant a prey to enemies it might otherwise despise; the soil unrelieved of superfluous moisture so intimately associated with rust; the unprotected field on which the north wind swoops down with fury, driving the covering of snow away first, and withering up vegetation afterwards, are every and each one an open door at which disaster may enter no matter how all may otherwise seem to be guarded.

The answer will, however, perchance be that many have not capital for such improvements. No doubt this is true in a large number of cases. The great difference in the means and advantages of wheat growers, as well as the very different natural conditions of the widely-separated tracts of country over which the wheat growing area of Ontario extends, are some of the causes that make all averages or attempts at striking an average so very uncertain and unsatisfactory. But, if a man has not capital enough to embark in one line of business he may be wise in turning to another, and one of the finest features of agriculture is its diversity. If wheat growing does not pay, it is better to give up growing wheat. No farmer should be content to make only four or five dollars an acre on his staple crop. Nor is wheat growing in these days a necessity. It is agreeable to grow one's own breadstuffs, it is convenient, too, to have a crop that can be marketed at any moment for cash at the world's market rates. These, and other reasons, will always induce farmers to grow a certain amount of wheat, just as they may plant apple trees or grape vines, or keep one or two choice dairy cows even if they pay little attention to butter-making. But, discussed as a simple economical problem, the man who for want of means, or by reason of an unsuitable soil and situation, cannot realize ten dollars an acre on his wheat crop, over and above all charges, had better turn his attention to other crops or departments of his business. How many farmers have ever stopped to inquire seriously what a bushel of wheat actually costs them, is doubtful. It is hoped that with the discussion now awakened, they may be more prone to "figure up" results than hitherto. And if they find they are losing either by paying more for their wheat than it sells for, or are missing the opportunity of doing better by sticking to wheat, then their good common sense will soon find a solution of the difficulty.

Reasoning upon very obvious historical facts, Ontario will never become one of the great wheat producing countries of the world. The centres of wheat growing have moved rapidly westward, and, in the memory of persons now living, the industry has well nigh deserted Eastern Canada and the Eastern States of the Union, while it is not even to Illinois men now look for the wheat supply of the

future. Not that all the advantages are on the side of the prairie region wheat grower. Where the area sown is so immense and the population so sparse, rough methods are sure to prevail. Cultivation, in the sense in which that word is understood even here, is little thought of. The exhausting process will go steadily on, diminishing in a few years the average yield. Damages by storms that sweep with remorseless fury over the vast plains, at times bring ruin in a few hours, and the breeding ground of the Rocky Mountain locust and the pastures of the dreaded chinch bug are, as entomologists tell us, ever present sources of terror to the western wheat grower. And, where all the requisite conditions of success are secured, the cultivation of a certain acreage of wheat by the Ontario farmer may, it is seen, be made extremely remunerative. It is very doubtful indeed if it will pay at ordinary market prices—say a dollar a bushel—to grow twenty bushels of wheat at a cost of \$15 to \$16, or 75 cts. to 80 cts. per bushel, but no one will question the wisdom of the farmer who, by expending \$20 can raise 35 to 40 bushels on the same land. And it is just in the additional outlay of the four or five dollars supplying the thing or things wanted to assure success, that the whole difference consists.

Spring Wheat.

Spring wheat has been of late literally a failure all over the country. Isolated cases of a good yield there have been, and, rather curiously, the finest crops seen by the Commissioners were on a newly cleared farm in Muskoka, but, as a rule, the crop has been a loss to the growers. The most curious circumstance is that the collapse has taken place in most cases within the last three or four years, at least so say the witnesses, although it is fair to observe that memory is often misleading as to dates, and statistics are usually wholly wanting. Checking memory by statistics, when there are materials for such a comparison, it is sometimes seen how memory is at fault. For instance, Mr. Walter Riddell gives evidence as follows :—

“I am growing both spring and fall wheat. The average yield of the former for forty years has been thirty-two bushels to the acre ; for the last three years it would be about twelve or thirteen bushels. I cannot account for the falling off in the yield. It does not appear to yield grain in proportion to the straw, and is subject to attacks from the Hessian fly and the midge ; but apart from these pests there has been an unaccountable falling off in the yield. The rust has attacked the wheat extensively this year.

“Fife and Club wheat are the standard varieties, but I have also tried the White Russian and others. The newer varieties have proved very little better than the others. I have noticed that the wheat fails on new as well as on old land.”

Now Mr. Riddell's statistics show the yield of spring wheat to have been in his case as follows, commencing with 1879 and going backwards :—

	Bushels.		Bushels.
1879	$9\frac{3}{4}$	1873	$9\frac{3}{4}$
1878	8	1872	$18\frac{1}{2}$
1877	$20\frac{1}{2}$	1871	13
1876	12	1870	13
1875	19	1869	26
1874	$13\frac{1}{2}$	1868	11

The average of the last three years was, as Mr. Riddell correctly states, about thirteen bushels to the acre, but it is necessary in fact to go back—for not three but—nearly thirty years to find Mr. Riddell in the enjoyment of really large crops of spring wheat, as the following figures show:—

	Bushels.		Bushels.
1850	25	1853	22
1851	27	1854	$27\frac{1}{2}$
1852	32	1855	27

Going still further back, however, to the earlier times of Mr. Riddell's record it will be seen that matters were not so favourable as they afterwards became; as, for instance, the yield was:—

	Bushels.		Bushels.
1841	15	1844	20
1842	$17\frac{1}{2}$	1845	$18\frac{1}{2}$
1843	29		

Thus in 1877 the crop was as good as it was in 1844, and considerably better than in 1841, 1842 or 1845, and, bad as it was in 1879, it was equally bad in 1873. The average of the four years 1876-7-8-9 would be $12\frac{1}{2}$ bushels, and of the four years, 1876-8-9-70-1 it would be $13\frac{1}{4}$ bushels, no very startling difference. While, in the very early days of Mr. Riddell's farming there may have been causes for the crops being inferior, it is quite likely that when his yield was highest his farm was in its best state of cultivation. Moreover he says: "The farm on which the crops from 1841 to 1867 inclusive were grown, was a first-class farm. The farms on which the rest of the crops since then were grown cannot be said to be more than second-class. This accounts, in part, for the great falling off in the crops." So that, when comparing the figures of to-day with the days of the heaviest crops, there is the disturbing element of a change of farms to be taken into account. Finding such difficulties in connection with the evidence of one witness, a gentleman of whose desire to be most exact and truthful there is abundant evidence, creates a doubt as to how far the memory of others not so fortified with statistical records is to be depended upon, or as to the time the falling off actually began to be felt, and the precise difference between the yields of the present and those of the past. Possibly a review of a few of the statements made will help, if not to exact, at all events, to some general conclusions.

Mr. Hobson, of Mossburgh (Wellington), says:—

"The reason the farmers have sown less of spring wheat is that it has failed

a good deal. I think the cause has been partly climatic. The failure has been so noticeable on the best tilled lands that it could not have arisen from the land being worn out, or from imperfect tillage. We could not find out any particular cause except something like a blight—not a rust. Fife was the variety of spring wheat chiefly grown. It formerly grew very well in our neighbourhood. On the best tilled lands I think the average has not been much below eighteen bushels to the acre, and it has often been a little more; but when you take the general average of all the farms, it has been exceedingly low. We are, of course, troubled with other causes of failure besides the blight, such as the Hessian fly, and rust and midge. The general average of wheat is much lower than it was some years ago.”

While the land may not be worn out by imperfect tillage, it is notorious that the Fife wheat has greatly deteriorated, and if, on the best tilled farms, eighteen bushels have been obtained it is a pretty good result as compared with the too general experience. Good farmers, however, like Mr. Hobson and Mr. Drury, whose evidence is next quoted, think, and very properly think, eighteen bushels to the acre a poor outcome. Mr. Drury does not seem to use the Fife wheat. It is consequently new varieties—one he terms the Spring Treadwell, a name not mentioned by other witnesses, and not known to the Commissioners—and the White Russian, a wheat introduced by Professor Brown of the Model Farm, he has sown. Mr. Drury says :—

“My spring wheat has been a comparative failure for four years past; but the Treadwell of which I speak has not failed to so great an extent as the other varieties. According to my own observation, the failure of the spring wheat crop is characterized by the straw being weak and breaking down with the ordinary rains, and by being attacked with a blight. During the last two or three years the whole of the wheat each year was destroyed in two or three days. The average yield of the Spring Treadwell has been eighteen or twenty bushels to the acre up to last year, when I don't think it averaged more than twelve or fourteen.

“The Spring Treadwell I have grown for four years. The White Russian is a new variety just coming into use in our section; but I think it will be the leading wheat for the next two or three years. With me the Spring Treadwell has been more successful, however. I do not know any other name applied to this wheat; it is a bearded wheat and resembles fall wheat very much, being coarse, strong, and tall.”

Mr. Dickson, of Tuckersmith, who finds the application of salt to the land has an excellent effect in stiffening the straw of his spring wheat crop, managed to raise twenty-three and a half bushels to the acre in 1879 of the Lost Nation variety, a wheat so similar to, as not to be distinguished from, the White Russian, and which is probably the same wheat. His White Fife in that year did not yield more than seventeen bushels. Both were grown after turnips on a clean rich soil. He was formerly able, he says, to get from twenty-eight to thirty-three bushels to the acre of Red Chaff, but cannot do so now. The Fife wheat is probably played out. Mr. Dickson's case is not so bad as to justify the conclusion that his spring wheat may not see better times with the introduction of new varieties.

In Kent and Essex no attempt to introduce new varieties was reported by the

witnesses, and the success attending the cultivation of fall wheat has largely compensated for the falling off in the spring wheat crop.

In Lanark the Fife wheat is the variety that has failed most conspicuously, and while the Lost Nation, and one or two other new varieties, have been tried they make but a poor show, although a better one than the old wheat. Still, in one instance, Mr. Clark, of Montague, expected two acres of Lost Nation to yield forty-five bushels. Very similar reports were obtained from other farmers, in the eastern sections of the Province, to those mentioned. The peculiarity in the case is, however, the rather sudden falling off within a comparatively recent date. There is, probably, nothing very phenomenal in this. The old varieties of spring wheat, particularly the Fife, having been run down, they have been subject to a greater degree year by year, to unfavourable atmospheric or other causes, when such have prevailed. The fair presumption is that these have been more than usually prevalent of late, and have found the wheat a too ready prey to their influences, the older and less vigorous sorts being most seriously and quickly endangered. In Durham, Ontario, and York counties the Arnautka—probably identical with the Wild Goose wheat—has been tried, but not with very large results in point of yield. It is a hard, rough class of wheat and met at first with no favour from millers, but they seem to be growing more used to, and consequently less prejudiced against it.

The condition of spring wheat growing is one that deserves to be watched carefully by the Department of Agriculture, the agricultural societies, and scientific observers generally. Should the crop continue to be a partial failure with no more clearly apparent causes than now exist, an investigation by thoroughly qualified experts might be desirable.

PROFESSOR BROWN'S ESTIMATES.

As Professor Brown's figures have been frequently referred to, and as they exhibit a different plan of calculation from that pursued by other witnesses, it may be convenient to give a description of his system *in extenso*. He starts with the following estimate of the cost of each operation:—

Cost of Work on Various Crops.

Common ploughing of stubble.....	\$1 50	per acre.
Common ploughing of sod.....	2 00	“
Gang-ploughing.....	0 75	“
Harrowing, once.....	0 20	“
Cultivating, once (grubbing).....	1 00	“
Rolling, once.....	0 20	“
Horse hoeing, once.....	0 50	“
Hand hoeing, once, taking an average.....	2 25	“
Drilling, with single plough ...	0 75	“
Root sowing, with drill.	0 35	“

Grain sowing, with drill.....	\$0 25	per acre.
Hauling and spreading farm-yard manure, 15 loads.	3 75	"
Sowing artificial manures.....	0 25	"
Harvesting wheat, oats, or barley, including mowing, binding, shocking, and hauling.....	2 25	"
Harvesting peas, pulling and hauling...	1 75	"
Topping, harrowing, and hauling mangolds or turnips	8 50	"
Pulling, topping, and hauling carrots.....	8 00	"
Ploughing, gathering, and hauling potatoes.....	5 50	"

Rotation.—Manures.

"The rotation after breaking up the sod, is :—1st, peas ; 2nd, fall wheat, spring wheat, or oats, according to condition of soil ; 3rd, roots, which should bear the manure for the whole rotation ; 4th, barley or wheat, seeded with grasses and clovers ; 5th, hay ; 6th, hay or pasture, according to conditions ; and, 7th year, pasture.

"The amount of manure per acre is 15 loads of barn-yard manure, 300 lbs. of bone dust, 250 lbs of salt, 200 lbs. of gypsum, and 300 lbs. of mineral superphosphate. It has been the regular practice to use these quantities for the last five years—all mixed together and applied at one time."

Crops Included in the Calculations.

"The actual produce under the rotation for the last five years, from 1876 to 1880 inclusive, and the average produce per acre, have been as follows :—

Peas.	30	Bushels.
Spring Wheat.....	17	"
Fall Wheat.....	35	"
Oats.....	41	"
Mangolds.	725	"
Turnips.	614	"
Carrots.	540	"
Potatoes... ..	165	"
Barley	32	"
Hay...One ton and four-fifths of a ton, weighed when it is taken in.		

Cost and Profit of Each Crop.

Roots.

Fall ploughing once, spring ploughing with gang once, grubbing twice, harrowing twice, and rolling twice, costs.		\$4 05 per acre.
Manure (farm-yard), fifteen loads	\$19 50	"
300 lbs. of bone dust.. ..	4 00	"
250 lbs. of salt	0 50	"
200 lbs. of gypsum	0 50	"
300 lbs. of superphosphate	4 80	"
Cost of distributing manures	4 00	"
Altogether for manure	— 33 30	"
Horse hoeing twice, hand hoeing twice, drilling, cost of seed and seeding, and harvesting		15 65 "
Total cost of producing mangolds or turnips		\$53 00

How to Charge the Cost of the Manure.

In regard to the only debateable part of this statement—the apportionment of the manures used—Mr. Brown goes upon the plan adopted by Dr. Laws, of England, who has been experimenting in this respect for the last forty years.

Credit $\frac{4}{5}$ of unexhausted farm-yard manure	\$15 60
“ $\frac{2}{3}$ of special manure	6 90
	<hr/> \$22 50
“ allowance for extra cultivation of roots, in view of future crops.....	2 50
“ half expense of distributing.....	2 50
	<hr/>
Total.....	\$27 50
To be deducted from.	53 00
	<hr/>
Leaving as the actual cost of an acre of mangolds or turnips.	\$25 50
The value of an average crop of mangolds or turnips, 670 bushels, at 9 cents, is	60 30
	<hr/>
Profit per acre.....	\$34 80

Value of the Turnip Tops.

If the crop were to be credited with what is left of the tops of turnips, which are said to be equal to what is taken off the soil in the bulbs, the result would show a greater profit still, although Mr. Brown does not go that length.

Cost of Grain Crops.

“The cost of producing the various grains per acre is as follows:—

WHEAT.

Fall ploughing, gang-ploughing, harrowing, seed and seeding, rolling, harvesting, threshing, and pre- paring for market.....	\$8 35
Debit value of manures, half of residue.	12 50
	<hr/>
Total cost.....	\$20 85
Value of average crop of 35 bushels of wheat at \$1.15.....	\$40 25
Value of $1\frac{1}{2}$ tons straw at \$5	7 50
	<hr/>
	47 75
	<hr/>
Wheat, profit per acre.....	\$26 90

OATS.

Work as above for wheat	\$8 35
One-third proportion of manure residue	8 33
	<hr/>
Total cost.....	\$16 68

Value of average crop of 41 bushels, at 40 cents ..	\$16 40	
Value of 2 tons of straw, at \$6.....	12 00	
		<hr/> 28 40
Oats, profit per acre		<hr/> \$11 72

BARLEY.

Work as above for wheat or oats	\$8 35	
One-fourth proportion of manure residue	6 25	
		<hr/> \$14 60
Total cost		
Value of average crop of 32 bushels, at 65 cents....	\$20 80	
Value of one ton of straw.....	3 50	
		<hr/> 24 30
Barley, profit per acre.....		<hr/> \$9 70

HAY.

Mowing, making, and hauling	\$1 50	
One-fourth proportion of manure residue	6 50	
		<hr/>
Total cost	\$8 00	
Value of 1 $\frac{1}{5}$ tons of hay, at \$10	\$18 00	
		<hr/>
Hay, profit per acre		<hr/> \$10 00

PEAS.

Sod-ploughing, seed and sowing, and harvesting	\$5 25	
Unexhausted manure	3 00	
		<hr/>
Total cost	\$8 25	
Value of 30 bushels of peas at 60 cents	\$18 00	
Value of 1 $\frac{1}{2}$ tons of pea straw, at \$5	7 50	
		<hr/> 25 50
Peas, profit per acre		<hr/> \$17 25

CARROTS.

Cost of cultivation, as for mangolds and turnips	\$48 86	
“ harvesting.....	8 00	
		<hr/>
Total cost	\$56 86	
Credit unexhausted manures	25 00	
		<hr/>
Actual cost.....	\$31 86	
Value of average crop of 540 bushels, at 15 cents ..	81 00	
		<hr/>
Carrots, profit per acre		<hr/> \$49 14

POTATOES.

Cost of cultivation as in other root crops	\$48 86
Cost of harvesting	5 50
Total cost	<hr/> \$54 36
Credit unexhausted manures	25 00
Actual cost	<hr/> \$29 36
Value of average crop of 165 bushels, at 35 cents....	57 75
Potatoes, profit per acre	<hr/> \$28 39

It is probable that many farmers will take exception to the foregoing apportionment of cost, and to some other details. The whole plan is, of course, open to discussion, and no one will rejoice more than Mr. Brown to find that discussion on so important a subject is excited. It is rather the plan or system than particular results, that the Commissioners desire most prominently to present to notice.

Coarse Grains—Barley.

The cultivation of coarse grains, although not treated as exhaustively as that of wheat, was referred to in the examination of most witnesses, and also in the printed questions issued by the Commissioners. Except, as regards barley, which appears to be affected in some instances in a similar manner to spring wheat, although elsewhere a bountiful crop; and peas, which have of late suffered terribly from the pea bug; no special or particular troubles attend the cultivation of coarse grains, and, if deficiencies occur, they may usually be traced to the want of proper care or interest on the part of the farmer to secure a larger yield. The cost of growing barley is about the same as that of raising spring wheat, and the two crops are grown very frequently under similar conditions. The fluctuations of barley in value are, however, more violent than those of spring wheat, and impart to its production something of a speculative character, which occasionally proves more attractive than profitable, although, at times, the crop is highly remunerative. The yield of barley is returned at about twenty-five bushels per acre, all over, from thirty to forty bushels being a frequent yield in good barley-growing sections. Of the counties, Perth gives the largest average, of $33\frac{1}{2}$ bushels; but then Perth is an old county, and well cultivated generally; while Hastings suffers by comparison, and, owing to its large area of rough and newly-opened country, although in the front townships 40 bushels to the acre are easily secured, gives an average of only twenty-two bushels. Mr. Ketcham Graham, Sidney (Hastings), who raised 3,200 bushels of barley last year, says:—

“Barley is grown very largely in my district, as it is the most profitable crop we can raise. The average yield is about forty bushels to the acre; and I think sixty cents per bushel for it—which I consider a low price—is quite equal to \$1 for wheat, and it is a safer crop. The barley grown in the Bay of Quinte District is the highest standard of barley for American maltsters’ use.

"I do not think that barley is anything like so exhaustive a crop as oats or wheat, and at the present time I am following my barley crop with fall wheat. My plan for the last three years has been to plough sod, take off a crop of corn or peas, then barley, plough the land three times, and sow it in fall wheat, seeding down with timothy in the fall and sowing clover the following spring."

"Barley never fails except in black muck land, when it may be attacked by the grub or wire worm, but even that is exceptional. During an experience of twenty-one years I have only found that the results of a spring wheat crop equals that of barley in two years."

Mr. Graham says farther on in his evidence:—"The average price is 70 cents, and the yield 40 bushels to the acre."

Mr. Walter Riddell, in the next county to Mr. Graham (Northumberland), whose useful tables of 38 years' crops have been already referred to, puts his barley crop as follows, from 1867 to 1879, on his present farm—"a second-class farm," as he terms it:—

	Bushels.		Bushels.
1868.....	18	1874.....	30
1869.....	22	1875.....	22½
1870.....	27	1876.....	11
1871.....	24	1877.....	18
1872.....	25	1878.....	20
1873.....	18¼	1879.....	25

An average of 23¾ bushels to the acre. But, on his former farm, a "first-class one," he raised, according to his record, as follows:—

	Bushels.		Bushels.
1856.....	37	1862.....	27½
1857.....	12	1863.....	32
1858.....	12	1864.....	38
1859.....	28	1865.....	30
1860.....	32	1866.....	33
1861.....	28	1867.....	22

An average of 27½ bushels notwithstanding two exceptionally unfavourable years.

Mr. Riddell says of the period from 1841 to 1867 the average of barley was 27¾ bushels per acre, and the price a little over 67 cents per bushel. His largest crop was in 1845, when it reached 50 bushels; 38 bushels in 1864 was the next in volume. Professor Brown, at Guelph, raises on his system of rotation 32 bushels, and values it at 65 cents a bushel, or \$20.80 per acre. Mr. Riddell's return averaged in the 27 years \$18.59 per acre. Mr. Graham, with 40 bushels at 70c., would show a return of \$28 per acre. As he points out, however, Bay of Quinte barley brings the top market prices. Taking the average all over at 25 bushels, and the average market price 65c., the return is \$16.25 per acre. Mr. Graham gives the cost of barley growing as follows:—

Rent, or interest.....	\$4 00
One gang ploughing.....	0 40
Two other ploughings.....	2 00
Harrowing.....	0 50
Seed.....	1 20
Corn cultivating.....	0 30
Harrowing and rolling.....	0 60
Harvesting.....	1 50
Threshing.....	3 00
Manure.....	2 50
	<hr/>
	\$16 00

Mr. Brown puts it at \$14.60, but that does not include interest or rental. Mr. Drury fixes it at \$13.20. The returns to questions put it at \$12.93. On the other hand Mr. Brown charges the barley with \$6.25 per acre as its share of the manure expended on the rotation in which it is an ingredient, while Mr. Graham puts manure down at \$2.50. It is probable that about \$14 per acre represents the cost of growing barley, which, at the all-over average, would leave on the grain a profit of \$2.25 per acre; on Mr. Brown's estimate, omitting the straw, \$6.20 per acre; on Mr. Riddell's former experience \$4.59 per acre; and on Mr. Graham's yield \$14 per acre. Of course the straw is to be added for what it is worth to either of these calculations.

Mr. Drury, speaking of his experience of barley growing in his district, says:—

“There is not much barley grown in the northern part of the County of Simcoe; it is grown more largely in the southern part. Barley, I have no doubt, is an exhausting plant, and takes out of the land more than twice as much food as is required for wheat. We came to the conclusion, as we heard that other portions of the country were producing fifty or sixty bushels of barley to the acre while we could only obtain thirty bushels, that we could not raise it profitably. Some farmers in our district will not raise more than twenty-five bushels. The barley falls very much in the same way as the spring wheat; the straw softens and breaks down with the blight.”

In Kent the profitable cultivation of fall wheat and the low price of barley of late years has caused the growth of barley to be almost relinquished. On the other hand in the front counties east of Toronto, the tendency to grow barley in place of spring wheat has been greater. Mr. Noble, in Northumberland, gives 30 to 35 bushels as the average, and mentions that as much as 50 bushels to the acre have been raised. In York too, Mr. Smellie speaks of barley as an important crop, yielding from 30 to 35 bushels to the acre.

In what may be fairly termed good barley growing districts, from 30 to 35 bushels per acre would seem to be a yield easily obtained, the crop being subject to few casualties, and the profits in those cases satisfactory.

Oats.

The average yield of oats is put down as $33\frac{1}{4}$ bushels per acre. The average price may probably be reckoned at 35 cents per bushel, and the cost of raising at \$9.50 to \$10 per acre.

In some instances, however, a crop very much in excess of the average as above stated, is secured. Mr. Cochrane, of Kilsyth (Grey), says:—

“The variety of oats that yield the most with us is the old Black Main oat. The kind I have been using lately is the White Australian. I have not sown the Surprise oat lately, because they shelled a great deal in cutting, and they were thick in the skin. The best yielding oat I ever had was what was called the Spanish oat, weighing with me forty-eight and a half pounds to the bushel, and producing seventy-five bushels to the acre.”

Mr. Drury grows oats largely, raising from 35 to 40 bushels to the acre. The price obtained from the lumbermen for oats raised in that district will average 40 cents per bushel. In Kent, Mr. White puts the yield of oats at about 50 bushels to the acre. In Essex, Mr. Iler puts the average at about 40 bushels. Mr. Gibson, in his rotation, takes credit for 750 bushels of oats on ten acres at 42 cents a bushel, and shows a balance of profit after charging everything (except manure) of \$240, or \$24 per acre. He includes in this 15 tons of oat straw, at \$4 per ton, \$60. Mr. Motherwell, of Bathurst (Lanark), last year raised 60 bushels to the acre, the crop being greatly benefited by the application of some 300 lbs. of salt per acre. Mr. Peter Clarke, of Montague (Lanark), often gets 50 bushels of oats to the acre. Mr. Andrew Cochran, of Ramsay (Lanark), has had crops of oats ranging from 20 to 90 bushels to the acre, but puts 45 to 50 bushels as the average. He says:—

“I have grown oats from 20 to 90 bushels to the acre; the average would be 45 to 50 bushels. I have ploughed the land well in the fall, cultivated and sowed in the spring, with good results. I attribute my large crop of oats to this system. We never sow with a tube drill. It takes $2\frac{1}{2}$ to 3 bushels to the acre of seed. I have never sat down to estimate the cost of raising any particular crop.”

Mr. Macfarlane, of Ramsay, reckons 35 bushels an average crop, but it has reached, he says, 60 bushels.

Mr. Riddell's tables show that, for the five years ending 1879, on his present farm, the yield of oats has been as follows:—

	Bushels.
1875	30
1876	34
1877	34
1878	32
1879	36

or an average of $33\frac{1}{3}$ bushels per acre; and for the last five years of his former farm as follows:—

	Bushels.
1863	44
1864	52
1865	48
1866	45
1867	40

or an average of 45 4-5 lbs. per bushel per acre—a steadiness in both instances most remarkable. For the twenty-seven years on his old farm he says in a note, the yield of oats averaged 42 bushels per acre, and the price for the total quantity averaged 32 cents, a very low figure indeed. Mr. Noble of Haldimand Township puts the average at 30 to 35 bushels, with an occasional yield of 50 bushels. Professor Brown raises 41 bushels, estimating their value at 40 cents and that of the straw, two tons, at \$6 per acre—an aggregate return of \$28.40 per acre.

Peas.

The pea crop, until interrupted by the ravages of the pea bug or weevil, noticed already in connection with injurious insects, was regarded as a safe one, and highly popular with the farmers of Ontario. The large demand for seed peas from the States, the admirable effects of peas used as feed, the use of the straw as the best of winter fodder, and the benefit to other crops from the cultivation the pea demanded, all combined to induce the agriculturists of the Province to devote a large area to the growth of this product. The pea bug is to-day the only obstacle to pea-growing.

The average yield of peas all over is set down at $18\frac{2}{3}$ bushels to the acre, somewhere in the neighbourhood of twenty bushels being generally about the calculation of the farmer in ordinary districts, but in others, where the soil and climate are particularly favourable, much larger crops are raised. Mr. Cochrane of Kilsyth (Grey), for instance, says :—

“Perhaps you may think I was not speaking with certainty when I told you I got as much peas as oats from my land. The fact is, I sowed a five-acre field with peas from which I sold 212 bushels, and I feel perfectly sure I have forty-five bushels to the acre this year from one field. I grow Second Early. It is a white pea. I sow about seven pecks to the acre. I am not aware that Golden Vine is sought after more than Second Early. Twenty-two bushels per acre was my very best yield of Golden Vine.”

Mr. Drury also finds pea-growing very profitable. He says :—

“We grow peas extensively, and the pea crop is found to be very profitable. The maximum yield of peas is about 30 bushels to the acre; the average would be probably 25 bushels. The Golden Vine is the principal variety grown. It is a small pea. We have not grown the Black or the Marrowfat pea to any great extent. The average price per bushel obtained for peas is about 55 cents. This year I sold peas for 63 cents, which I think is a little above the average. I do not think there is any special course to be followed in preparing the ground for the pea crop. I put the cost of raising an acre of peas at \$13. The pea crop is generally sown on

the spring ploughing. We have no failure in the pea crop except what is caused by unfavourable weather—occasionally too much rain. We have no mildew. Peas are the best crop we have. I have never seen a pea bug in our district. The pea crop is usually followed by wheat. The cultivation of the pea has a beneficial effect on the land; a heavy crop of peas leaves the land in as good a condition as a summer fallow. If the pea crop is a partial failure, it allows weeds and thistles to grow up; but I hold that a good crop of peas leaves the ground in as good or a better condition than it was in before it was sown. Peas ought, I think, certainly to be sown with drills, as they are better covered in that way than when sown by hand."

Mr. Dickson, in Huron, says:—

"The farmers in my district have ceased growing peas almost altogether. I used to get 50 per cent. more for black-eyed Marrowfat peas than for any others. Before the pea bug came I raised 30 bushels to the acre. Latterly the bug became so bad that there was scarcely a pea that had not a bug in it. I may state that I received the first prize for the best two bushels of black-eyed Marrowfat peas at the Provincial Show in 1877."

Mr. Douglass, of Blantyre (Grey), mentions 25 to 30 bushels to the acre as his average, and Mr. Gibson of Markham, takes credit in his rotation for 25 bushels, while alluding to the crop as so far injured by the bug as to be a failure. Mr. Brown at the Model Farm raises 30 bushels to the acre. While Mr. Brown allows for pea straw \$5 per ton and \$7.50 per acre, Mr. Gibson allows \$4 per ton. The cost of raising peas, according to the information received by the Commissioners, averages \$11 per acre. Mr. Drury, as above, fixes it at \$13 per acre, Mr. Gibson in his rotation at \$13.50, and Professor Brown at \$8.25, exclusive of any charge for rental or interest as against the crop. Mr. Gibson, whose yield in the calculations referred to is set down at 25 bushels per acre, at 60 cents, shows a profit of \$7.65 per acre; while Mr. Brown, who raises 30 bushels, which he credits at the same price, shows a profit of \$17.25 per acre. While, however, Mr. Gibson only claims to secure a ton of pea straw at \$4, Mr. Brown gives 1½ tons at \$5 as his yield. If we charge Mr. Brown's profits with the \$5 rental which Mr. Gibson includes in his account, the difference between the two will be found to consist in just about the value of the five bushels per acre raised by Mr. Brown over and above the crop of Mr. Gibson.

Having regard to the many respects in which the pea crop is found serviceable as a factor in the economy of the farm, both as regards the stock and cropping branches of agriculture, and the profit which with good farming attaches to the crop itself, it only requires that the bug should be got rid of in order to make pea-growing in a high degree advantageous to the Ontario farmer.

Indian Corn.

Although Indian Corn is cultivated in various parts of the Province its growth on a large scale is chiefly confined to the southern portion of the southwestern peninsula, particularly the counties of Kent and Essex. Except that of

late it has, in some places where the land has been brought into proper condition, been superseded by fall wheat, it maintains its popularity in the two counties named as a very valuable crop. Mr. White puts the cost of raising corn at \$15 per acre, the yield at 50 bushels, the value of the straw as fodder at \$5, and the price at an average of 40 cents, although at the time the Commissioners were in Kent the price ranged from 50 to 60 cents per bushel. According to Mr. White, the return from a crop would be \$25 against an outlay of \$15. Corn, however, is of a value beyond its direct profit to the farmer in money. It is a crop which can be raised in rich rank land, of which a large quantity recently reclaimed is to be found in the counties mentioned, and thus in time prepares it for other crops. The cultivation of corn, too, is a valuable preparation of any land for subsequent use. Mr. White thus refers to corn-growing in Kent. He says:—

“I think corn is a very good crop for the farmers to raise when the land is suitable. It does good to the land by necessitating its being cultivated and kept clean. Then for fodder purposes if it is cut before the frost, an acre of corn is worth almost as much as an acre of hay, for feeding cows and other cattle. Next to wheat, corn is perhaps the most profitable crop grown in this county.

“When planted in hills, the hills should be about four feet apart, with three stalks to the hill. As to the cost of the crop, the interest or rental would be about \$2.50. The cost of the seed would be very small—about one bushel to six acres.

“A man can plant with a hand planter about four acres in a day, or with a horse planter, ten or fifteen acres. Sowing and harvesting would be about \$5; the total cost about \$15 an acre. A great deal of our corn is shipped to people in the east for feeding purposes. Buckwheat is not much grown here.

“My calculation is that the cultivation we have been describing would give about 50 bushels to the acre, of shelled corn. About 40 cents per bushel is the price we get when it is brought in from the fields in the fall. If we keep it till spring we have to depend on the meal, whereas in the fall people want it for feeding. That would show a result of about \$20 an acre. The fodder is worth about \$2 per ton—it is better for milch cows than hay. We don't use it for cutting up to fatten stock. I put the fodder at about \$5 per acre.

“The ordinary price at which corn has been sold in this country during the last few years has been 40 cents. At present it is selling at 50 cents and 60 cents, and of course we are participating in the advantage. I have heard of corn being bought for 30 cents, but of course that was not the regular market quotation of the day. I regard corn as a paying crop at 40 cents, because besides the price, it cleans and shades the land, and does it a great deal of good in that way. We grow a succession of crops of corn where the land is very rich. The preference for wheat has rather tended to diminish the growth of corn. A great deal of corn is used locally for the feeding of cattle, as our stock is all fed on corn and not on roots.”

Mr. Iler, another witness from Essex, had also much to say on the subject of corn-growing. He says:—

“We grow corn largely. It is grown for the grain in ninety-nine cases out of one hundred—very little being grown for fodder. The crop is usually successful, and the average per acre about forty bushels. The varieties generally grown are the large yellow and white Gourd Seed, though the yellow and white Flint are

also grown. These are eight-rowed varieties. Corn has been badly injured by the rain, but I don't think it can be said that the corn crop is subject to failure in our part of the country, though late corn in back settlements is sometimes nipped by the frost. I think that our county can produce corn successfully, and I don't know that we have any regular failures.

"We don't have any large quantities to export, but sell it to our local traders and distillers. Mr. Walker takes about all the corn we can raise for his distillery. It is not necessary for us to import corn from the United States, though very small quantities are imported.

"There is not much difference in the cost of raising corn and wheat. We have no husking machines in our county. We put it up in shocks and husk it by hand.

"We store it in cribs; a great many of them are built out of poles, but some are now building corn houses of lumber, leaving cracks for the circulation of the air. Good corn houses are generally built double, each side being about four feet wide and eight or nine feet high, with space between sufficient to allow a team to pass through.

"The larger varieties of corn are generally planted with three feet eight inches between the hills, and three stooks to the hill. That is about the right distance, though it is sometimes planted thicker. Flint corn may be planted three feet six inches between the hills, and four to the hill.

"Corn usually realizes about 50 cents per bushel, taking one year with another, and we consider it a profitable crop in our county. A great deal of it is used in feeding hogs and cattle, and it is the surplus which the distillery takes."

Mr. McCain, another Essex witness, says:—

"A great deal of corn is planted on clover sod, and we put it in without reference to rotation at all. We generally pick the best ground for corn. I have a poor corn farm, and I have grown about sixty bushels of shelled corn to the acre. Fifty bushels per acre would be about the average for the township.

"The straw is very good for feeding purposes. If the stalks are cut and mixed up with bran and middlings, it makes splendid food for dairy or fattening purposes, or for horses. The stalks are too rank for cattle to eat by themselves, and they are apt to dry out.

"Even when they are dried out and bleached there is still nourishment in them. The stalks are worth from three dollars to five dollars per acre for fodder, which would make the corn crop worth about thirty dollars per acre on the average."

Mr. Elliott, of the same county, gives some further particulars respecting corn-growing in his district, which may be interesting to those in other places who are not familiar with such processes. He says:—

"Corn with us grows to an average height of ten or twelve, sometimes fourteen feet. I got some corn seed from Missouri which took the first prize at the State Fair in that State. It is dented at the end of the kernel, the same as the corn grown by dairy farmers for fodder. Imported corn has to be naturalized before it succeeds well. If planted this year it would be all right for next year's crop.

"The first thing we do is to plough the clover ground and harrow it, and this we do in the month of May; then we mark it out from three feet eight inches, to four feet each way, and we plant three, four, or five grains in each hill. Some plant with a planter, but I do it by hand, as I tried the machines but did not find them at all satisfactory, as they are apt to plant too much. Then if you set them

to drop only three grains to the hill, they will very likely not drop any at all. However a good many people in our neighbourhood use them, though our best corn raisers plant the corn by hand. I find the machine particularly unsatisfactory in planting large corn, as there seems to be no certainty of having the grains drop regularly, and you are unable to ascertain until the corn grows how it has been planted.

"We commence to cultivate as soon as the corn is up, just at the time when we can see the rows from one end to the other. We cultivate it from four to six times, using a double shuffle plough—one shuffle coming behind the other. We never use the hoe at all. The plough throws it up in ridges to some extent. The shuffles are very small—very little larger than those of a farm cultivator. We work the plough with one horse. We cultivate from four to six times, say three times one way and three times across. Some days of course will intervene between these times of cultivating. Some use a harrow, but I do not. Some people use a two-horse cultivator, the horses straddling the rows. We manage to keep the weeds down by our method of cultivation. Some farmers use a single shuffle plough the last time of cultivating, and throw the land up in ridges. I prefer having it on the level. Heavy winds sometimes blow the corn to one side, but it generally straightens up again. The corn seldom suffers much unless it is a tremendous storm.

"When we cut the corn we take hold of the stalks in a hill in the usual way. When we are going to put the ground into wheat, we generally carry twenty rows on each side, which leaves a space between the shocks of forty rows. That makes a wide land.

"The corn is then left until we get through the hurry of the work, and then we husk it. We tie the stalks round the top with elm bark. We use the bark of the common elm, as we have no rock elm. Sometimes we try fifty trees before we can get one to peel. We notch under the bark with an axe, and then hitch a horse to the end and let him do the peeling. It would not pay us to use wire because we can get the bark for nothing, and a man and a boy can peel enough in a day to tie forty acres. We have about 20,000 acres of wood in our township.

"We have no process of husking by machines that we find satisfactory. We found that it was as much trouble to take the corn to the machine and to carry away the fodder, as it would be to do the work by hand. We have hand husking machines. Our corn is much easier to husk than the Flint corn. Ours is the yellow and white Dent corn. We husk the corn from the shock in the fields, and put it in piles and draw it to the crib with a waggon. The spaces between the shocks are ploughed and put in wheat, leaving lands about ten or twelve feet wide where the corn is. When it is husked some stand the fodder on the wheat and drive along the spaces, and in the spring these spaces are ploughed up and put in oats. This accounts for the appearance of many of the fields in our part of the country—strips of oats appearing in our fields of fall wheat. We seed down again with clover on the wheat."

Mr. McGregor in his report on the products of the County of Essex (Appendix S) says :—

"We do not export largely of corn, but we sell about 100,000 bushels a year to the distillers in the county. The remainder is used in feeding pork, which brings us in annually, about \$400,000. Corn is about the most certain crop we have."

As a grain crop corn can be grown successfully, not only in the counties of Lambton, Elgin and Norfolk, but also in the Owen Sound district, and in

some of the northern and north-eastern counties. As green fodder it is very extensively cultivated elsewhere.

In his report of a recent visit to Washington, Mr. Hilborn, a member of the Commission, refers to the experiments conducted by the Bureau of Agriculture there, in regard to the sugar-yielding properties of corn. Mr. Hilborn says :—

“Mr. Le Duc finds that sorghum can be successfully and profitably grown in the northern part of Minnesota, which is a higher latitude than Ontario; his experiments also show that sugar can be successfully made from it.

“He also exhibited to me a record of experiments in the manufacture of sugar from corn stalks, which he has carried to a sufficient length to render its success no longer a question of doubt, the record showing a yield of from 900 to 1,000 pounds of sugar from the stalks of an average acre of corn, gathered when the corn was ripe, so that no loss of corn was sustained, and the cost of manufacture being but three cents per pound. The sugar produced is fine in flavour and capable of producing the highest grades by being refined. Mr. Le Duc computes that the stalks from the corn grown in the state of Illinois would supply all the sugar used in the United States at a cost of three cents per pound for manufacturing. That being so, is there any good reason why the corn fields of south-western Ontario should not be made to sweeten the tea and coffee of the Canadian people?”

The growth of sorghum is somewhat extensively carried on in Essex as well as the manufacture of sorghum sugar and molasses. A manufactory on a considerable scale has been recently started for the latter purpose at Tilsonburg, in the County of Oxford.

Rye.

The cultivation of Rye is very limited, although it may have been stimulated by the recent rise to something like double its ordinary value, occasioned by the failure of the Rye crop on the continent of Europe, and a consequent large demand from this side of the Atlantic.

As a grain crop Rye is looked upon as hardly a creditable product by many farmers, the short reply to a question by one of them that “he had no land poor enough for rye” indicating the light in which its cultivation is regarded.

Mr. Drury only grows it “as a green crop to plough under.” Mr. White (Kent), “does not know of any rye being grown” in his part of the country. Mr. Iler refers to it as only raised for fodder. In the eastern part of the Province it is more frequently grown. Mr. Clark, of Montague (Lanark), grows fifteen to twenty-five bushels to the acre, and, he thinks, profitably. Mr. Black, of Ramsay (Lanark), says :—

“I had a fine crop of rye two years ago. I regard the crop as more exhausting than others, although rye will often grow where other crops fail. The grasshoppers did not destroy the rye crop as it was too early for them. A good deal is grown in the township.”

According to the township returns from Ramsay about 100 acres is devoted to rye, with an average yield of twenty bushels. It has been suggested that rye might in some of the rougher sections take the place of fall wheat as being less subject to winter-killing. Last winter, however—a very unfavourable one, it is true—a good deal of rye in the township just referred to was winter-killed.

Mr. Meighan, of Perth, a large buyer of grain and dairy produce, in the course of his evidence says :—

“ We buy grain largely. The demand for rye for export to Germany and Belgium has been largely on the increase. I think the trade will continue from natural causes. Our reports from Antwerp are that the sample gave great satisfaction. The impression of the trade is, that our rye is superior to the American. Farmers say they can grow it on poorer land than other grain crops. I am buying at 78 cents to-day for a good sample. Where freights are cheaper it will bring 80 cents, and at Toronto it is up to 85 cents. I know farmers who have substituted rye for wheat with profit. Previous to 1879, I think 50 cents was the highest price we ever gave for rye.”

The average yield of rye all over, would, according to the returns, appear to be 16 bushels, but it is probable that in the districts where it is chiefly cultivated—particularly Lanark and Renfrew, where, in many cases the average is put at 20 bushels, and in one case, at 30 bushels to the acre, the yield will approximate 20 bushels. At the prices named by Mr. Meighan, the crop, having regard to the soil in which it will grow, and the amount of cultivation it usually receives, will be a paying one, although at normal prices, except as a means of utilizing poor land, it can hardly remunerate the cultivator.

Root Crops.

The cultivation of root crops should increase concurrently with the greater attention to dairying and stock raising, but so far this has hardly been the case in Ontario. That in a number of townships the area devoted to root cultivation is small, and in too many utterly insignificant, is not creditable to the judgment and far-sightedness of our farmers. That this does not arise from any inadaptability of the soil, or other unfavourable circumstances, is shown both by the oral evidence and returns. Some of the evidence will be worth quoting.

Mr. Hobson (Wellington) says :—

“ I plant from twelve to twenty acres with roots on a farm of three hundred acres. The average yield per acre, I think, would be about 550 bushels. . . . I raise a few mangolds, which I think are exceptionally good for the latter part of the spring. They come in well after the turnips. They keep better than the turnips, and are fresher. Although they are not so good for fattening purposes, they are very good for stock that are giving milk.”

Mr. Hobson casts some doubt upon the very large crops of turnips sometimes alleged to have been obtained. At Bow Park, however, where mangolds are grown extensively, although the soil does not appear to be well adapted for

turnips, Mr. Clay can raise 30 tons of mangolds to the acre. But that is under exceptionally favourable circumstances, both as to soil, cultivation and manure.

Mr. Drury says with regard to root crops ;

“ We grow a few carrots for our horses, but we have not grown mangolds. We generally have a fair crop of turnips, unless the dry weather makes against the size of the roots ; unfavourable weather is the only enemy of the turnip amongst us. I think probably 550 bushels to the acre would be the average we grow. Last year I raised a thousand bushels to the acre under exceptional circumstances. I think a root crop exhausts the land to a certain extent. It is not indispensable in a rotation of crops. But a farmer, when he wants to clean a portion of his land, instead of leaving it a naked fallow, naturally says to himself that if he can clean his land and obtain a quantity of roots for his cattle at the same time, he will do so. I find it almost essential to have some roots for my stock. Of course I have done without them, but I find that cattle do not thrive well unless they get some turnips every day. I never estimated the cost of raising an acre of turnips. I usually sow as near to the 20th of June as possible. If you sow earlier the plants are apt to be injured by the fly, although the early sown roots are likely to be more solid than those sown late. A late sown turnip may attain to a good size, but it will not weigh so much or be so solid as one of an equal size sown earlier. I have never been troubled with turnips rotting ; but generally speaking, an early sown turnip will keep better than one late sown.”

Mr. Dickson (Huron) says :—

“ I grow from eight to ten acres of root crops a year—carrots, mangolds, and Swede turnips. I depend chiefly on the turnips as a food supply for my cattle. The turnip crop is a tolerably certain crop. The fly sometimes does considerable damage. Generally the farmers sow from the 15th to 20th June. Early sown turnips are most likely to be attacked by the fly. The average yield of turnips is from 600 to 800 bushels per acre ; there may be some instances in which the yield is greater than that.”

It is quite consistent with the too primitive fashion in which farming is still carried on in many parts of Kent and Essex, as well as with the large area devoted to Indian corn, to find Mr. White (Kent) saying :—“ Scarcely any roots are grown in this part of the Province.”

In Waterloo, Mr. Andrew Elliott raises between 600 and 800 bushels of turnips to the acre.

Mr. Andrew Cochran, of Ramsay (Lanark), says :—

“ I have grown from 600 to 1,000 bushels of turnips to the acre. I once got 1 000 bushels of potatoes off two acres. From 250 to 300 bushels would be the average yield. I never measured the mangolds, but they have done well. Of carrots I have raised at the rate of 1,200 bushels to the acre.”

Mr. Smellie, Vaughan, (York), says :—

“ Mangolds and carrots seem to be the most profitable roots to raise in our section. Turnips seem to be a failure because of the fly which attacks them, and destroys them completely sometimes. We have adopted no particular means of exterminating the fly.”

Mr. Douglass, of Blantyre (Grey), says :—

“ In preparing my land with a root crop to lay down grass I take the

manure out in the fall and plough it under, and in the spring work it up as early as I can. I generally plough it twice in the spring. I gang-plough it, but not very deep, and then I plough it again with a gang-plough or single plough, ploughing about five or six inches deep. After that I drill it up and sow it.

"I don't use any artificial manure, nor have I tried any. I have sown salt on the wheat. I have never grown any mangolds, but grow Swedish turnips. From 500 to 600 bushels per acre is my average crop of Swedish turnips. In cultivating roots we give them at least three horse hoeings, and we generally hoe them twice by hand. I think it is good to grow roots in connection with grain-growing.

"With the turnips I generally fatten from six to seven head of cattle. I don't think a root crop such as turnips is very exhaustive on the soil. . . . I generally put about twenty loads of manure to the acre of turnips."

Mr. Cochrane, of Kilsyth, in the same county, says:—

"I may mention that roots do well with us. Our township society has been in the habit of offering prizes for the best acre of turnips. Last year the acre which took the first prize produced 1,016 bushels, and the acre that took the second prize 1,000 bushels, and the acre that took the third was somewhere in the neighbourhood of 1,000 bushels. They calculated this quantity from weighing the turnips grown on one square rod, taking up that quantity in three different parts, and the average of these parts as the average of the field. I believe the man that got first prize had a hundred bushels more to the acre than they gave him credit for. With good culture I don't think there is any difficulty in raising 800 bushels to the acre in my neighbourhood, with farm-yard manure alone.

"I sow plaster on my turnips a week or so after thinning. We are not troubled with the turnip fly much unless we sow very early. I never sow mine before the 15th of June, and I have never lost a crop by the fly. The varieties we sow are the old East Lothian, Sutton's Champion, and the King of Swedes."

At the Model Farm, Guelph, Professor Brown puts the averages of the root crops taken from a five years' experience as follows:—

Mangolds.	725 bushels.
Turnips.....	614 "
Carrots.....	540 "

The returns received give the averages all over as, turnips 453, and other root crops (not including potatoes) 318 bushels to the acre. This, excluding districts where the area cultivated is hardly worth mentioning, and the soil not at all adapted to roots, will fully justify the conclusion that 600 bushels of turnips can be grown under ordinarily favourable conditions, and rather more than less than that quantity of mangolds. When, therefore, Professor Brown puts the average of mangolds and turnips at 670 bushels he is claiming far less than many good farmers have accomplished, and no more than anyone with proper judgment can attain to. The information as to carrots, except in a few isolated cases, is too meagre to discuss averages upon. Mr. Brown in putting his return at 540 bushels is giving an experience rather different from that of many who expect a larger yield of carrots than of other roots. But even that estimate shows in Mr.

Brown's calculation that carrots are a highly profitable crop. Of an acre of mangolds or turnips he makes the cost of manuring and cultivation to be \$25.50, against a yield of 670 bushels valued at nine cents per bushel, and shewing a balance in favour of the crop of \$34.80. He adds:—

“If I were to credit the crop with what is left of the tops of turnips, which are said to be equal to what is taken off the soil in the bulbs, the result would show a greater profit still, although I will not go that length.”

The cost of an acre of carrots he puts at \$31.86, the value of the crop—540 bushels at 15 cents per bushel—being \$81.00, showing a balance in favour of the grower of \$49.00. As already noticed, Mr. Brown does not charge rental or interest in these estimates. But few farmers will be prone to doubt their ability to grow crops as large as those stated, with such an expenditure as Professor Brown charges them with. It is said that roots are an exhausting crop. Some object to entering into their cultivation, to a large extent, on that ground. If the Commissioners were reporting upon an investigation into the principles and science of agriculture they might be able to show that these views are exaggerated. But, basing their report as far as possible on strictly practical evidence, they prefer to remark that, let root crops be exhausting or not, the farms on which roots form one of the most prominent factors in the year's operations are the richest farms, the crops the finest crops, and the farmers the most prosperous, both as to their current operations and the gradual accrual in value of their real estate. The cultivation of roots in Ontario might be enormously increased with corresponding profits. To what our soil, with proper management, will do in this respect, every agricultural show in the Province bears witness, and it is only for others to pursue the same course as those who have been so far successful to achieve the same results.

W E E D S .

In noticing the cultivation of various crops it would hardly be proper to omit allusion to some of the eminently prolific species of spontaneous or voluntary productions that appear with a degree of certainty and regularity in too many sections of country. Among these the Canada thistle as it is termed, stands conspicuous. Its increase is even alarming in some districts, and its tenacity in holding its own and propagating itself defies even the power and authority of the Legislature to restrain or suppress it. The Canada Thistle Act gives ample powers to municipalities as against offending thistle-growers. Its leading provisions may be briefly described as follows:—

1. Every occupant of land must cut down thistles as often as necessary to prevent them from going to seed. For neglecting to do this he is liable to a fine of not less than two, nor more than ten dollars for each offence.

2. The overseers of highways are charged with seeing the provisions of the

Act carried into effect. For refusal or neglect of duty in this respect they may be fined not less than ten nor more than twenty dollars.

3. Said officers must give notice to any occupier on whose land Canada thistles are growing and in danger of going to seed, to cut them down within five days from service of notice. The notice must be given not later than the 25th of June.

4. If the occupier does not attend to notice, the overseer of highways may enter upon his land (provided it is not sown with grain) and cut down the thistles, the cost being chargeable to the occupier, and recoverable from him in the same manner as taxes.

5. The Act applies to railway companies' property as well as private occupiers, notice in that case being given to the nearest station agent.

6. No notice is necessary in the case of non-resident owners of property.

7. Offences under the Act are to be subject to the jurisdiction of Justices of the Peace, and fines are to be paid into the treasury of the municipality.

Professor Buckland alluding in his evidence to the thistle and other weeds says :—

“I think, too, that one of the great practical difficulties that lie before us is the dealing, not perhaps so much with ordinary weeds like couch-grass, or things of that sort, but with what is usually termed the thistle. Unless some efficient means be promptly employed to check, and, so far as possible, eradicate it, I believe that where it has obtained full hold of the ground, successful husbandry will soon become a matter of impracticability.

“I do not know so much about the extent of couch-grass, but I believe the thistle will progress more in the development of its roots in proportion to the food it gets. The dealing with thistles is no doubt a matter of difficulty, but within the last few years they have been increasing rapidly in many of the older sections of the Province, until now more than one-half of the soil in too many fields I believe to be occupied by them. Of course the food which the thistles extract from the soil is just so much nourishment taken away from the cultivated crops.

“There is no royal road to a cure for this pest. I remember the late Hon. Adam Ferguson was offered by a charlatan, for a good fee, an infallible method for eradicating thistles, which consisted in cutting them down with a scythe or a spud when in full flower, and that a little vitriol or sulphuric acid be poured upon the bruised stems, and so reaching the roots. It would take a great deal of sulphuric acid, I am afraid, to go over our fields in this fashion now-a-days.

“I have seen in England permanent pastures completely overrun with it, and the only way to eradicate the nuisance was found to be spudding it two or three times a year. We call it the ‘Canadian’ thistle, but it was probably imported in grain from Europe, and seems to be identical with the ordinary farm thistle of England. If spudded as soon as the leaves are developed, next year the plant becomes weaker, and in the following year can be nearly eradicated—that is, on pasture land. It is only by deep ploughing and getting at the roots, that the nuisance can be removed on cultivated land. I do not know that any machinery beyond the hoe or grubber can aid us. On pasture lands it may be killed, as I said, by depriving it of its leaves, but on lands which are cultivated for grain, a different system has to be adopted.”

Mr. Douglass (Grey) says :—

“We are troubled quite a bit with thistles. We are able to get them down to a certain extent by growing roots, but not entirely. . . . The Thistle Act is a dead letter in our district and never taken notice of.”

Mr. Smellie (York) says :—

“Now that the thistles have become so very bad I believe we will have to fallow a good deal more frequently. Summer fallow is the only cure for thistles. The field we are going to fallow I always plough in the fall of the year, and in the spring we run through it with a cultivator. We don't allow the thistles to peep at all that season if possible, because, if you do, you don't seem to kill them. If you never let them get their heads above the ground you will master them for about seven or eight years, provided there is no seed comes to your place from your neighbours.”

Mr. Hobson (Wellington) says :—

“The only remedy I know for the thistles is summer fallowing. They have to be looked after in July and August; but I found that, with all the working I could give to my land, spring and fall, they were gradually and slowly on the increase, so I adopted summer fallowing, and many of my neighbours have come to the conclusion that there is nothing like that for ridding themselves of the thistles. I think it is well to let the thistles get well up before ploughing them in, and you should select a time when the weather is fine and dry; but I would not let them get so high as to make it difficult to plough them in. If they got very high I think I would cut them before using the plough.”

Mr. John Miller (Ontario), says :—

“I think the best way to get rid of the thistles is to let them grow well up and then cut them down and plough the land. I do not think it is well to plough them until they are well grown up. We use turnips also to destroy the thistles. The truth of the matter is a crop of thistles means slovenly farming, or farming that brings with it the smallest amount of cultivation.”

The Commissioners have received communications on this subject from several quarters, and desire particularly to acknowledge one from Mr. Wm. Burgess, of Mimico, well known as an enthusiastic agriculturist and horticulturist. Where the thistle has not got hold too firmly the cultivation of roots is probably the best antidote and preventive, but where that fails the summer fallow is the only resource, the suggestions of the witnesses above given as to the time and mode of operating on the thistles being taken into account. That idle and selfish or ignorant people should be allowed to stock the whole neighbourhood with thistles, notwithstanding the efforts of their neighbours to keep their farms clear of the nuisance, is more creditable to the forbearance than to the public spirit of the community. The inaction has more of indolence and want of courage than real kindness or neighbourliness about it. A man who was once punished for wronging his neighbours, by neglecting to destroy his thistles, would be very likely to learn a lesson beneficial to himself.

The fox tail, or summer grass, couch grass, and the ox-eye daisy are also troublesome. As regards the treatment of the two last named nuisances, Mr. Benson, of Cardinal, says :—

“When I plough up the couch grass I plough it very shallow, and then run the hay rake over it and put it in a pile. I then plough it again and run a large-toothed cultivator through it. That discourages it, and I sow buckwheat on it and plough it down, and if I have time I give it another crop of buckwheat or peas. When I get it so low that I cannot see the couch grass I sow Indian corn. In course of time the couch grass is subdued. It makes pretty good fodder for cattle. For two or three seasons after seeding down the couch grass may get in again. When I put the couch grass in a pile I cover it up, and it rots, and afterwards makes very fine soil.

“The ox-eye daisy, however, beats me entirely. It both seeds and grows from the root. It is said that after three years it dies, but somehow or other the seed escapes. I am not an authority with regard to it. On my farm they were careless about the seed they got, and they found the ox-eye daisy in some timothy, and I have not been able to get it out. It comes in chiefly in the timothy seed which we get from the United States. The same plant is common in England. The root is a knot of fibres, and the plants grow about eighteen inches or two feet high. The flower has a bright yellow centre, with little spears coming out of it, and is about the size of a half-dollar piece. It is a marguerite. I suffer to some extent from the wild mustard, but we get rid of it by seeding down, and it does not come again until the land is broken up. I never have much trouble with the thistles. I don't know the rag weed; with me the ox-eye daisy, couch grass, and thistles are the principal weeds.”

Mr. Matheson, of Perth (Lanark), finds the thistles, couch grass, wild mustard and the ox-eye daisy at times too prevalent. The couch grass he regards as the worst of the lot. He says of it:—

“The prevailing noxious weeds in my district are thistles, couch grass, mustard and daisy. The couch grass, I think, is the worst we have; the best remedy for it is summer fallow, and the same may be said of the mustard. I generally have a summer fallow, and plough under the weeds, as soon as the spring work is over, and after two or three ploughings, I cover the surface with manure.”

Alluding to the wild mustard, Professor Buckland says:—

“The wild mustard is more difficult to manage, but I should recommend that, where a person has a field overrun with this weed, to allow it to get into full flower and then mow it, not taking any crop off the field that year. But, where wild mustard seed has got into the soil, it will frequently reappear, sometimes growing very thick after it had apparently been got rid of. Deep ploughing takes it under, and deeper ploughing brings it up again. I do not consider it so dangerous a weed as the thistle. I am not aware how long the seed will remain under ground without losing its vitality. I have known it to be brought up from a depth of three or four feet without losing its vitality. If buried sufficiently deep to preserve it from the influence of moisture or the air, I should say it might continue under ground for centuries, and still germinate if brought to the surface under favourable conditions. I think the only cure for rag-weed is to pull it out.”

Mr. White (Kent) says of the weeds in his section:—

“We have not very much trouble with weeds in this section of the Province, though there are some cases in which crops have been thinned by some cause—perhaps by the severity of the winter—and the weeds spring up, principally rag-weed. Wild mustard is bad where farmers are careless. Red root is making its appearance, and the Canada thistle is increasing in some parts of the county.”

Mr. White makes rather light of the rag-weed. It may be less difficult to

deal with than some noxious plants, but the Commissioners who visited Kent were struck with the profusion with which it was found growing there. If careless farming be as responsible for the rag-weed as Mr. White asserts it to be for the wild mustard, there must be a good deal of farming that will bear improvement in that section.

Mr. Iler, Essex, says of the rag-weed :—

“We have no trouble in eradicating the rag-weed, as all that is necessary is to plough it under. If it is allowed to ripen I suppose the seed would spread, but ploughing it under kills it thoroughly.”

The Commissioners can have no hesitation in urging upon the intelligent farmers of Kent and Essex that, if the rag-weed is to be so easily got rid of, they should lose no time in “ploughing it under.”

USE AND TREATMENT OF MANURE.

“Farmers generally pay no attention to caring for their manure, and especially the liquid portion of it,” describes, in the words of one of the witnesses examined by the Commission, what, it is to be feared, is too much the practice of Canadian farmers in regard to the most potent factor or agent in their whole operations. Even when determined not to be behind-hand in providing a good supply of barn-yard manure, too many will allow it to depreciate day by day, while the most essential ingredients are permitted to evaporate or to be washed away into the nearest creek—polluting and poisoning the water, instead of nourishing and stimulating the land. Professor Buckland says on this point :—

“As to manures, the conclusion I arrived at when in the habit of going through the country in past years, was that, if the absolute, naked truth could be got at in any way, it would be found that the manurial power of our barn-yard dung, from exposure and want of care, loses, at least, 25 or 30 per cent. of its value. If we look at the worth of the manure thus wasted; its loss cannot be regarded as other than a national calamity. I would say, however, that during the long period that I have known this country, there has been, of late, considerable improvement among many of our farmers in this respect.”

The venerable Professor adds, in connection with the subject of liquid manure :—

“Somehow or other, a large proportion of our barn-yards are placed near creeks or small bodies of water—presumably for convenience in watering the stock—and very much of the liquid manure, the most valuable part, escapes into these creeks or bodies of water, and so is lost. If our barn-yard manure were properly cared for, and not exposed to the drenching of untroughed roofs, it would be much more valuable than it is now; it would be worth thousands, perhaps millions of dollars more than under its present treatment. It should be kept under cover, if possible, and a very little attention would prevent a great deal of the present waste, not only in quantity, but particularly in quality.”

Professor Bell says :—“Liquid manure is worth five times as much as solid manure, if properly saved and manipulated.” With a very little care, however,

the liquid may, if not preserved separately, be absorbed, and, in all essential respects, its value be saved to the agriculturist.

Management of Manure.

Of the very few farmers who, among those examined, had really adopted any systematic method of managing their manure, the plans of one or two deserve special mention. Mr. Matheson, of Perth, thus describes his mode of saving and treating manure. He says :—

“I keep most of my manure in a pit, under cover, and I preserve most of the liquid manure in the same way. I have a ‘lean-to’ attached to the cattle-shed, and the pit for the reception of the manure is under it. The cattle stand and feed together with a gutter behind them which gathers most of the liquid, which is all pure manure, and is carried into the pit. I put up a shed 90 feet long by 30 feet wide, and in that I have two rows of cattle which face outwards. In front of them, at each side of the shed there is a water-tight trough and a passage, and they stand some distance apart on the platform, which is about five feet six inches wide. They are all tied with chains, and behind each row of cattle there is a gutter about twenty inches wide and eight inches deep, and between the two rows of cattle there is a passage four feet wide, on which the manure is wheeled out.

“At the side of this building I have a ‘lean-to’ which runs half its length, is fourteen feet wide, and is sunk two feet in the ground. It is water-tight, so far as we can make it. Three sides of this pit are boarded tightly with hemlock plank, and, on the fourth side, there is a passage eight or ten feet wide for a cart or waggon. I do not use any straw for bedding; sawdust is the cheapest thing I can get for that purpose, and it soaks everything up, increases the bulk of the manure, and makes its quality very fine.

“*One load of this manure is equal to two or three loads of what I formerly turned out.* The gain which I have derived from preserving the manure for the land has been very large. The roots I grow are turnips, mangolds, carrots, and sugar beets; I have had 500 bushels of roots to the acre.”

Two of the Commissioners visited Mr. Matheson’s farm and inspected his arrangements, which appeared to be admirably adapted to the object he has in view.

Mr. Benson, of Cardinal, adopts a different system, but one that has the merit of economizing to a very large extent the liquid portion of the manure. He describes his plan as follows :—

“I bed my cattle on sawdust, which is an absorbent, and makes a vast pile of manure. The sawdust I use is not common sawdust from a sawmill; it is sawdust and the shavings from seasoned lumber. It comes from a stave factory and a box factory, and the whole of the lumber is kiln-dried, and the sawdust, therefore, absorbs all the moisture that comes from the cattle more rapidly than straw. I never use pine or cedar sawdust, because it is difficult to rot; but I confine myself to the use of basswood and elm, which decompose quickly. Very few people have equal facilities for getting such a pile of manure from such good material.

“I carry the manure to where I keep it in an enormous pile, and allow it to remain till the fall or the following spring. The difference between the sawdust I use and pine sawdust is, that my sawdust rots in the soil, whereas pine sawdust simply mixes with the soil, perhaps loosening it, but not manuring it so well, as it decays more slowly. There is another great difference. All the sawdust from the sawmill is wet, both from the logs being soaked in the water, and from the sap;

but the sawdust that I use is dry, on account of its having been seasoned, and there is nothing left in it but fibre, and when it is used for bedding it is mixed with urine, which decomposes it more rapidly than water."

Professor Bell, it is proper to remark, objects to the use of sawdust, although Mr. Benson does not appear to have found the evil results from it that Mr. Bell suggests as likely to ensue. Professor Bell says:—

"I am not very partial to the use of sawdust as an absorbent of liquid manure, as it is apt to promote the growth of fungoid spores, especially hardwood sawdust. The use of the tank and the water cart is what I would recommend, or, if they were too expensive, a natural or artificial reservoir, such as is used in earth closets. The liquid should either be mixed with earth or diluted with water, as it is too strong in its natural state, and should be applied at an early stage in the plant's growth. It should not be used fresh, but allowed to enter upon the first fermentation."

Mr. Elliott, of Colchester (Essex), used hardwood sawdust for a time, but gave it up, as he thought it injured the soil, giving as his reason, that perhaps the soil was too open.

Mr. Matheson, whose excellent arrangements have been already described, beds all his horses and cattle, it will be observed, with sawdust.

In Essex, where a large number of hogs are kept, and the richest kind of animal manure is, consequently, at the command of the farmers, it appears to be looked upon rather as a nuisance than otherwise. Mr. McCain, of Gosfield, for instance, says:—

"Farmers do not take any pains to utilize hog manure by mixing it with bedding or straw, though they know its value. If I have a field convenient to the house, I generally put the hogs in it. Some people put them in pens and keep them confined, but no means are adopted to preserve the manure in the pens. It takes too much labour to bed hogs in straw for the purpose of making manure, and farmers do not try much to save it. I know that our practice is a careless one, but time will remedy it. I think bedding the hogs in straw and making a compost would be better than burning the straw. Hogs generally fatten best in a large field, but in winter we generally let them shift for themselves around the straw stack, etc. We have places to shelter them, such as sheds, etc."

As it is "too much labour" to bed the hogs in straw, some of the farmers, Mr. McCain says, burn it. He says:—

"The straw is worth \$1 per load, though some people haul away the straw and burn it, as they think that they can get all the manure out of the ashes in that way. They say that their land has been materially benefited by burning the straw. I have lived in Essex since 1835. I was in Australia four years, and I noticed that the Englishmen there burnt their stubble. I was a farmer for a short time in Australia."

Because they are too idle to bed their hogs these worthy persons are content, by burning the straw, to get the minimum instead of the maximum value out of it, and waste the hogs' manure besides. Mr. Graham, of Sidney (Hastings), says as to his method of managing manure:—

"I think it desirable to cover the manure with earth, if labour is not too dear.

I generally draw it from the barn-yard to the field where we want to apply it, simply because it is less expensive. I do not keep any pit or reservoir for the liquid manure, but believe that it would be a good thing to do so. I always try to use enough straw to absorb the liquid manure."

Mr. Thomson, of Brooklin, is in the habit of leaving the stable manure in the yard, without turning it. He takes it out green in the fall and ploughs it in.

As to the management of manure, Professor Buckland says :—

"I would recommend that, where black muck soil, or any vegetable porous matter, can be readily got, a bed of such material be formed as a foundation, and the dung heap be placed upon it, after the former has been exposed to the drying influence of the sun and air. The heap should also be surrounded with a wall two or three feet high, and with this dry absorbent substance, which is also a manure in itself, the value of the manure heap would be much enhanced.

"Land plaster is a very valuable substance, and ought to be in every barn-yard, not only for the purpose of absorbing the liquid portion of manure, but, also, because it has a tendency to fix the volatile alkali, which is injurious to animals in confined structures. The ammonia that escapes from a close, ill-ventilated stable during the year is very hurtful to the eyes of horses, and to their general health, and, by sprinkling upon the floor a little sulphate of lime (plaster), a great deal of this vapour would be converted into sulphate of ammonia, which does not readily decompose or evaporate, and is, in itself, a valuable manure. The same remark would apply to the manure heap.

"I have always advocated the composting of our barn-yard manure to a considerable extent, and as you are building your heap, to sprinkle upon it a little sulphate of lime or common salt, which I think would be more useful in that way than if applied by itself.

"I do not think that barn-yard manure loses so much of its power by exposure during the winter, as many people imagine, for decomposition in a cold, dry atmosphere takes place very slowly, and sometimes not at all; but the trouble is that, when the frost breaks up and the spring rains come, it gets thoroughly drenched and the most valuable portion of it—the salts—become solvent and are carried away. Therefore I should always, where it can be carried out, prefer to plough it in rather than leave it exposed on the fields during winter."

The Professor also expresses the opinion that the germination of seeds in the manure would be very likely to be prevented by its fermentation. This induces him to prefer fermented to green manure.

Professor Brown, speaking on the same subject, says :—

"With reference to the question of manures, my experience goes to show that a very important item in its management, is covering so as to prevent the rain from washing it. Our practice is, simply to put it out in a heap, mixing the horse manure with the cattle manure.

"In order to save it from too rapid decay, we always have made a point of scattering a quantity of gypsum over the heap. There is nothing so good as to send a pail of gypsum around twice a week. This retards too rapid fermentation, and, of course, adds very much to the manurial value of the heap.

"I need not say anything as to the importance of preserving the liquid manure—of course that adds very much to the value of the heap. One of the best ways to prevent too rapid fermentation of the manure is to let the cattle run over to compress it and prevent too much air from penetrating it.

"I always use farm-yard manure in a rotted state. If we believe what the

chemist tells us, there is no question but that there is a very large value in bran as a food for the production of manure. There is no better way of putting the idea than by saying that the best food makes the best manure."

The great value of the application of the gypsum in fixing the ammonia, and thus retaining in a new form one of the most valuable of the ingredients of the manure, cannot be too strongly presented. Mr. D. Caldwell, of Galt, thus explains his mode of preparing his manure. He says:—

"I generally make muck compost as far as possible. I have used swamp muck largely. I have taken it out of swamps and pond-holes, wherever I have been able to get it, from this time in the year on to the fall, and emptied it out anywhere that was most convenient, let it remain there during the winter exposed to the frost, and then used it next summer in the way of compost, mixed with barn-yard manure and ashes. I have found it a great benefit to apply it, owing to the fact that our soil here lacks vegetable matter. I put on about fifteen loads of the compost to the acre. In the mixture I have generally put about two loads to one load of manure, and perhaps a load of leached ashes. I would use muck all the time as a compost. I apply it just the same as I would farm-yard manure, and I find in digging around our trees three or four years after putting it on, that there is more of it to be seen than of any other manure. I tried muck before I subsoiled, and found it beneficial even then. There is nothing that will improve clay soil more than muck, because it keeps it open and porous."

Mr. John Smith, of Harwich (Kent), already alluded to as a large cattle buyer, says:—

"We have found the effects of manure upon the land to be wonderful, and we manure freely. We haul the manure right out on the land in the winter time, and in some cases we pile it up and take it out in the fall. We find good effects produced in both ways, and I do not see much difference between them, only that in the one case the effects will not appear until the next crop. There is no such thing as cutting straw in our part of the country."

In the treatment of manure, it stands to reason, that, to provide some shelter for it and so prevent the effects of the drenching rains would be most expedient. An open shed for this purpose, adjoining the barn, would be little expense and soon repay its first cost. Of course, where a small outlay is no object and facilities exist, the separate preservation and distribution, properly diluted, of the liquid portion, would do wonders for the farm, especially the green crops. But, as a rule, farmers will prefer to secure the absorption and retention of this part of the product with the solid matter. In that case some such plan as Professor Buckland suggests will probably answer best. Either by boarding the heap or sinking a pit three or four feet in the ground and making a bedding of swamp muck (first well sweetened by exposure to the air and frosts) and distributing land plaster through it from time to time, the quality of the article will be not only retained, but enhanced.

Effects of Liberal Manuring.

Manure is not only in many cases improvidently managed, it is too often illiberally applied. The same quantity of the best manure would be too little;

in its exhausted condition the allowance is often almost ridiculously insufficient. As a rule, ten or twelve loads, applied to a rotation of six or seven years, appears to be deemed enough. That is the quantity charged to his rotation by so good a farmer as Mr John Gibson, of Markham. But Mr. Gibson seems, from his evidence, to be looking to a larger production of this necessary element in his operations. For his turnip crop, Mr. Douglas, of Blantyre, applies 24 loads to the acre. Mr. Cochrane, Kilsyth, uses about the same in manuring for a rotation. Mr. Smellie uses 12 to 14 good waggon loads to the acre. Professor Brown, in his rotation, uses 15 loads to the acre, but then he applies at the same time 300 lbs. of bone dust, 250 lbs. of salt, 200 lbs. of gypsum, and 300 pounds of mineral phosphate. The crops he obtains under this system have been already frequently referred to. Mr. Wiser, whose various operations enable him to accumulate a very large quantity of manure, thus refers to the effect of a bountiful supply:—

“To show to what an extent an excessive amount of manure will benefit land, I have four small fields adjoining my paddocks that in the aggregate foot up twenty-eight acres and a third. I literally covered these fields with manure from the distillery in the winter of 1877-8, and the following season I cut 165 tons 1,700 and some odd pounds of hay at a single cutting. The land was in average good condition when I put the manure on it, and had been in sod for two or three years previous. This was only top dressing.

“That year the hay was so abundant as to be difficult to cure on the ground. A quantity of this hay when dry had to be pitched on the load without any raking at all; the balance was cured by driving a tedder through it, and having very pleasant weather at the time, by turning it and using the tedder repeatedly, we succeeded in curing and getting it in, in very fine condition. So abundant was it, that much of the first growth lodged down, and then there was yet another crop of grass grew up through this lodged grass. It was cut with a mowing machine, and besides the yield before spoken of there was a quantity we were unable to cut. I invited some of our best farm neighbours, and drove them over the ground, and the residue wasn't placed by any of them at less than a-half or a-quarter of a ton left on each acre of the ground.

“In making up the aggregate of the yield of those 28 acres, I concluded that there was a cutting of *not less than six tons to the acre*. This was arrived at by actual weighing, without any speculation or doubt about it, the hay being weighed when it was put in the barn, since which time I have had the ground accurately measured by a surveyor.”

The operation of manure on the crops is thus further referred to by Mr. Wiser. He says:—

“The only grain I had this last year was a forty-acre field. I had this field manured three years ago, and thus enriched that season's crop of grass, but I only cut 2½ tons to the acre off it, which was so light that I broke it up and successively raised two crops of oats on the same ground. This field the first year yielded 2,244 bushels of oats off the green sward. Last fall it was ploughed over three times, cultivated, dragged, and ploughed again. This spring I had it ploughed, cultivated, and dragged again, and sowed with oats, and seeded down. I had a yield this year of 74½ bushels to the acre, and a little over four tons of straw to the acre, arrived at, not by approximation, but by actual measurement and weighing. This forty-acre field is a light, sandy loam, faces the north, and has a slight

declivity for drainage towards the glen and rivulet that diagonally cross the front concession.

"I have reflected in this manner as to this field: the distillery manure, although spread excessively thick on it, was fresh and not well rotted and fermented, which I think resulted in less yield the first season; the second season necessitated a term of decomposition to fully rot all the manure and upturned sod, and this year I had the full benefits of all my manure, and as it is now seeded, I expect a bountiful crop of grass and hay from it yearly for the next five or six years. In seeding I used a mixture of four pecks of timothy seed and one peck of clover seed, and of this I distributed about one peck to the acre."

Used at the right time and in the right way, it may safely be affirmed that the returns will, proper attention being given to other requirements, be just in proportion to the liberality or otherwise with which manure is applied.

Under-Draining.

The work of under-draining has, as was, perhaps, to be expected, made less progress than improvements in some other branches of agriculture. Its necessity is not so clearly understood by many as it should be; the investment of capital it involves startles others. The natural drainage afforded by a porous subsoil and a rolling land, are the excuse of not a few for leaving under-draining alone for a season. Yet nothing is more certain than that under-draining, in ninety-nine cases out of a hundred, will prove a most profitable investment, and that, in a very large proportion of cases, the farmer's troubles arise from the fact that under-draining has been neglected. Pursuing the same course as that hitherto adopted of placing the actual experience of practical men before the public, one of the first and most striking instances of the advantages of under-draining was presented in the evidence of Mr. John Gibson, of Markham, already referred to in connection with crop management. Mr. Gibson went upon his farm in 1847. He thus describes the character of his farm at that time:—

"When I first went upon my farm it was a rather peculiar one. It was wet, but not springy. There were no springs upon it, but it was full of frog ponds, and altogether a low, wet farm, not at all adapted for raising fall wheat. I made up my mind that I would make it a good farm if possible, fit for raising any kind of crop, although at that time it was almost in a state of nature, new and full of stumps. I commenced upon a hundred acres, and I laid out a plan, roughly indicating what I intended to do."

That Mr. Gibson possessed no extraordinary advantages in the way of capital or extraneous aid, may be assumed from the fact that it took him thirteen years to bring the farm into condition for the systematic plan of operations he has since followed. Since 1860 his regular rotation has been carried out. In his calculations he charges \$5 per acre for rent or interest of capital. He says on this point:—

"When I charge \$5 for rent, I charge for a farm that is highly improved. Before I made the improvements on my farm it was not worth more than \$3 per acre."

"I consider, on the whole, that the expense which I have laid out upon my farm is repaid to me in the diminution of the labour on the farm, the comfort of horses, the ease with which the fields are cultivated and prepared for the crops, and the saving of machinery. There is one remark that I would make for the benefit of those who have not had so much experience in draining as I have. Care should be taken to have one drain run along the headland, so that when the horses turn they will always turn dry.

"Another advantage of draining is, that you are able to get the grain in earlier in the spring. I do not think that, during the last ten years, I have been later than the 20th of April in being able to sow, and I am much earlier in getting my grain sown than my neighbours, whose lands are not drained, and there is also a considerable difference in the yield of the crop.

"Before I drained my land it was hardly of any use for me to sow fall wheat in it. The highest average was from sixteen to twenty bushels to the acre, and when the midge came round a great many of my neighbours gave up growing fall wheat altogether. But after I had drained my farm I had almost always good crops of fall wheat, during the time the midge was at the worst."

The healthiness and vigour of the plant, promoted by a well-drained soil, would enable it to resist attacks that would be fatal to less thriving crops. Mr. Gibson's yield of fall wheat, as already noticed, averages forty bushels, the sample at the same time being so superior as to be eagerly purchased for seed at \$1.25 per bushel. Mr. Drury contributes an item from his experience. He says:—

"I have never put in any tile drains before this year. In one case I had a field that was unsafe for the stock to go into in certain seasons. I took that field, cleared the brush out of it, and grew several crops of hay, but it had always too much water. I drained it thoroughly, and the result is that it is better for the cattle than the higher land. Excessive moisture is not so bad for that field as for those where there are no drains. The water runs off, but there is no baked surface left behind; and the dry weather does not affect it so badly as it does the undrained fields. After having seen the results of my experiments in drainage, if I had to borrow money at ten per cent. I think it would pay me to drain my wet lands."

Mr. Dickson, of Tuckersmith, gives his testimony as follows:—

"My drainage has produced excellent results; the wet land which has been drained is the finest land on the farm. In the land with a clay bottom like ours, you can grow one-third more when it is drained than you can if it is not drained. Cedar drains, I think, will last longer than any other wooden drain. There are considerable quantities of land in my district that ought to be drained."

Mr. Alanson Elliott mentions a case, in his neighbourhood, where the value of under-drainage has been experienced. He says:—

"My land does not require any drainage, though some farmers have drained their farms. One farmer has used tile draining in one field, but it is not generally used. If the farm in question had not been drained he would not have had any wheat this year, and he had 25 bushels to the acre.

"The farm to which I allude as having been drained, was a low quicksand, which used to raise very heavy crops of rag weed, and the rag weed crowded out all other crops. The owner under-drained the land last season, *and this year the value of his crop will be more than double his outlay for the drainage.* He got his tile for \$10 a thousand, and he got the drain laid for 16 cents a rod. The tile was two and one-half inch tile. All of our land has a good natural fall."

Mr. James Black, of Ramsay (Lanark), who has drained extensively, says:—

“I have under-drained a good deal with tile, stone, and wood. I prefer tile. The effect of under-draining on the wheat, especially the Fife, was very good. I think draining is profitable. My farm was little good until it was drained. My success with wheat, formerly, was on the higher and dryer portions of the farm. The lower portions were entirely useless until they were under-drained. After draining, the lower portions were the most profitable.”

Mr. Andrew Cochran, another Lanark farmer, who has under-drained, says:—

“I would never have got such crops as I have mentioned but for the drains.”

Mr. James Thomson, of Brooklin (Ontario), who has expended \$3,000 on under-drainage, says:—

“I have carried on a pretty thorough system of under-drainage, having spent \$3,000, or thereabouts, on it. My drains are all three feet deep, and it depends entirely on the nature of the soil whether it would be better to make them deeper. On my land, with drains about a rod apart, the cost is about \$40 per acre. *I have no reason to regret the money I have expended on drainage, for previously, it depended entirely on the season whether I had a crop at all or not, and now a good crop is a matter of certainty.*”

Mr. Smellie, of Vaughan (York), says:—

“Under-draining has favourably affected the produce of my wheat. The effect of under-draining is that it takes away the under water, and of course the surface is dry and the wheat is not so apt to be winter-killed. The cause of wheat being winter-killed, is the fact of its having a cold, damp bottom. We have rust sometimes. *The drainage helps to keep down the rust a great deal. We have always found low places the worst for rust.*”

Professor Buckland says:—

“I do not think it is necessary to attempt any refined system of draining—what in England would be called thorough drainage—in this country, neither do I think it would generally pay. In England, and I have no doubt it has proved profitable there, the system is to run drains up and down a field at uniform distances, with little reference to what parts may be specially wet, or comparatively dry, but in this country I think we should first aid nature in draining. Nature is the first drainer and we should avail ourselves of the means she places within our reach, such as clearing out creeks and facilitating the natural egress of water by surface furrows and deep ditches.

“The value of drainage to a farm depends much upon the capability of the soil, and its marketable value. Good soils, that are wet, repay expenditure for drainage much more rapidly than moderate or poor soils in a similar condition. I certainly would not recommend our farmers to go into any stereotyped system of drainage, such as that in vogue in many parts of the old country, both because they have not the requisite capital, and because I do not think the land in general requires it. I do not mean that, if we drain, even what may be regarded as a dry field, we shall not improve it, but that the idea that we shall make it injuriously drier, is fallacious.

“I remember in clearing up the old University Park, in Toronto, where the soil in many places was very wet, we had a number of drains made, and the ground afterwards sown with grass seed, and wherever these drains were put through dry as well as wet ground, the earth having been moved, and the mois-

ture getting in when the grass seed was sown, little belts of green might afterwards be seen all though the driest summers for many years, indicating that we need not fear over-draining, so far as bringing the land into a good state for the sustentation of crops is concerned. There is, of course, a limit beyond which expenditure cannot be profitably carried."

On the same point, Professor Bell remarks:—

"Drainage is very necessary in this country, and sometimes as much so in dry as in damp soils, as the moisture is drawn from beneath the drain as well as from above."

Professor Brown says:—

"The proper drainage of land cannot produce drought; it has the very opposite effect. *Well drained land holds moisture longer than any other land, only it holds it evenly.* Upon the model farm we have had many practical proofs of the value of drainage. I can now point to fields there from which the removal of what is called superfluous water has produced wonderful results. Drainage allows of the free access of air into soil, and renders available material which would otherwise have been useless."

While uttering the caution that drainage alone, without good farming in other respects will not suffice, but rather represent money wasted, Mr. Brown goes on to say:—

"When land is properly drained, we can get upon it earlier in the spring, and this is a saving of time, labour and seed. Much of the seed sown in the spring is destroyed by various causes, and more is destroyed by water, and this destruction is avoided by proper drainage. It further assists us in pulverizing and cleaning our soils, as well as quickening the action of manures. . . . Drainage, therefore, hastens the harvest. It also increases the nutritive value of wheat and other grains. Another valuable effect of it, is the removal of the causes of diseases among certain animals. It improves the general health of the district, renders the water purer for animals, and altogether effects improvements which cannot be overestimated."

As to the effect of under-drainage on the value of lands, Professor Brown says:—

"With regard to the increased value and productiveness of land by under-drainage, I may say (1) wet land, such as swamps, is of no agricultural value; (2) half wet land, such as meadows, is worth fifty cents per acre in rent; (3) partially wet land, all over, is worth \$1.50 per acre; (4) land wet in spots, to the extent of one-tenth of its area, is worth \$2.50 per acre; (5) drained land, or naturally dry land, is worth \$3.50 per acre; land wet all over will cost \$30 an acre to complete; in new townships, therefore, under-draining doubles the cost of land, and in old ones, half the cost. *Drainage repays itself in four years, if followed up by good farming.*"

Cost and Methods of Drainage.

The cost of draining will depend (1) upon the extent of the plans on which it is undertaken; (2) the material used; (3) the natural facilities of which the farmer may be able from the situation of his farm, to avail himself. Professor Buckland, speaking of the various materials available, says:—

"Where access can be had to potteries, the best material to put into drains

is the tile or pipe ; it will be found cheapest in the end and most to be depended upon. But it is surprising how long even brushwood drains will endure, and what good they will do in certain soils. In England, I was personally aware of a case where drains kept open and did good service for thirty years, and where nothing had been used in laying them down but heather. The heather would, of course, decompose in a few years, and yet the drains remained open. The soil was a stiff, stubborn clay, and the field had been kept in pasture all the time. If it had been ploughed, I doubt whether the drains would have lasted so long.

"Many years ago we had to lay drains in University Park and could obtain no pipes or tiles, or anything of that kind, so we used ordinary bricks, hollowed out, placing one over the other, but wherever there was shifting ground or quicksands, though the bricks were laid with great care, in two or three years the drains became useless.

"If you have a box drain, so long as the joints keep tight, and do not allow the sand to get in, of course the drain will continue in good order, but where quicksands exist it requires the greatest care to keep them out of the drain. Wherever water will go, these impalpable particles will go to, and, by subsiding, obstruct the current."

Mr. Drury has had some practical experience in wood and stone drains. He says :—

"I have paid considerable attention to drainage, although I have not gone into any general system of drainage. I have not been able to use tiles until within the last year. Wood and stone drains are what I have used. For wood drains I have used two-inch scantling, with a six-inch board at the top and bottom, except where the soil is hard and solid, in which case the bottom board is not needed. I never used any other kind of wood than pine. I have some stone drains which are about twenty inches broad, and about three feet two inches deep, a little deeper than the ordinary tile drain. I have not had any difficulty with these drains clogging. Most of the drains have a fair fall. I would not put in a stone drain where it would have a flat or sandy bottom."

Mr. Gibson then explains his method of proceeding :—

"In originally laying out my drains, I did not go upon any principle as to distance apart ; but I laid them out on a plan, so that I could see where they were, if anything went wrong with them. When I first began under-draining it was an experiment with me, and I had to draw my tiles fifteen miles. Before that, I had spent a great deal of labour and expense in surface-draining my farm, but some places were so hollowed out that it was almost impossible to drain them effectually in that way. When I commenced under-draining I drew the tiles from Yorkville, fifteen miles.

"The average depth at which I put the tile drains was three feet. Some of the main drains were as deep as four or five feet, and were cut through rising ground ; but three feet was the average depth, except where it was necessary to have them deeper. On the surface of my land, about two feet and a-half is a fine, mixed, clay soil, pretty easily dug, and below that is a marly, white, gravelly clay, very hard to dig. I had hardly any difficulty in the way of quicksands.

"When I first undertook to drain my farm, I bought 'French on Farm Draining,' for my guidance ; but I found that the methods it proposed were too scientific and expensive for my purpose. I personally supervised the putting in of all the tiles, and put in some myself, so as to be sure that the work was properly done. I levelled the drains with water ; I carried water to some of them for that purpose, and levelled them from the top.

"I found that I did not require any tiles larger than three or four inches. In two

or three of these fields there are nothing but two-inch tiles, and they do very well in some cases. There are two places where there are four-inch tiles, and there are a few inch-and-a-half tiles, which do very well where the land is not very wet, and where the surface is good. If I were putting in parallel drains, I would put them in about thirty feet apart, but in very wet places I would put them a little closer.

"A good many people just run the outlet of their drains to the surface; but I prefer to make a box of oak plank, and build it up with stone. Only one of my drains was put down without a bottom; it was one of the three-inch tiles—what was called a horse-shoe tile; and that was the only drain that I had occasion to lift. I would not recommend the horse-shoe tiles, as the water washes the earth away from under them. I did not lay any timber under the tiles; it is not necessary on such hard land as my farm is composed of. I used to cover the joints of the tiles by putting a little straw on them, but I have found lately that it is not needed at all. I now just put the earth upon them."

Practical Directions.

Mr. Francis Malcolm, a member of the Commission, having had a very large experience in the laying out of drains, was requested to give an explanation of his method. He accordingly did so at some length, and, as the statement consists almost exclusively of practical details, it will be necessary to quote it almost in full. After perusing it, any farmer will have the necessary information for proceeding with the work of draining his own farm. Mr. Malcolm says:—

Fall and Outlet.

"The first thing a farmer should do is to obtain a thorough knowledge of the field as regards its condition at different seasons of the year. He should then inquire what are the natural conditions as regards outlet and fall that will admit of it being drained. These conditions vary very much. In some fields it will be very easy to get an outlet and a fall that are all he can desire, and in some it will be very difficult, and in others impossible.

"However, this may be ascertained by the use of a good spirit level and a straight edge, say eight feet long, the centre of which should be bolted, or attached by a clamp, to the side of a nicely painted hardwood stake, five or six feet long. By driving this stake into the ground at any desirable point on the line of the intended drain, the straight edge so attached may be easily turned to the exact level, while by one sighting to a measuring pole held by another person, at another point of the intended drain, a knowledge of the lay of the land may be obtained, and the best possible outlet found.

"A consideration of very great importance should be mentioned here, and that is, that, in commencing to drain, every step taken should be considered as the foundation of a system of more thorough drainage at some future time. Every tile that is laid should be at a depth, and of a capacity, that is not only sufficient to carry the water from the land lying near, but the water that must come through this outlet from more distant points, at, it may be, some future time.

"The first thing then to consider is the *outlet*, and this is of such importance that too much pains can hardly be taken to get a good one. To the drains above, it is as important as a good foundation is to a building. Success depends upon it. It is therefore the most economical in the end to commence with a good one, even if it should cost a good deal of trouble. What I mean by a good one is a free exit for the water from at least a three-foot drain.

“In regard to the *direction* a drain should take, no certain rule can be given, further than it should always be as far as possible along the lowest part of the field, so that lateral drains may be run into it from either side when desired. It is also important that as much of it as possible should be on a straight line. If the direction must change, on account of the lay of the land, it should be at angles, instead of curves.”

Cutting and Grading the Drain.

“When the course of the drain is made out, the plough should be run along the line and the earth shovelled back, and this repeated till all is done that can be done with horse power. Then, in order to make a perfectly even grade along the bottom, the following plan I have found to be excellent:

“It simply amounts to this; the erection of a line five feet above where the bottom is intended to be, so that the eye may be used in making it horizontally straight. Drive stakes in pairs, one on each side of the drain, and nail a strip of board between them, the upper edge to be straight and level, and five feet from the intended bottom. If the drain is to be three and a half feet deep, the upper edge of this board will be one and a half feet from the surface of the ground. The distance between those sights will depend on the length of the drain that is on a straight line.

“What is wanted is that the finisher of the drain should always have some two of the sights before him, and with a rod similar to the half of a carpenter’s ten-foot pole, try the bottom by setting it on end at every two or three feet, and sighting over the top, which should always correspond with some two of those horizontal sights.

“The trouble of erecting those sights may be largely dispensed with by simply driving board stakes (the upper end being a few inches wide), at such points as will not interfere with the digging, such as in the outlet or beyond the point to be dug at either end of the drain. But the upper end must always correspond with the line—five feet above the intended bottom. I say five feet, but any height may be used that is most convenient to the digger. If his sights are six feet above the bottom, then his rod must be six feet long in order to correspond.

“This plan of grading the bottom has become very general in the community where I live, and is found to be of great utility. I would therefore recommend it a trial, and especially if there is no water when the digging is done, which I think best. Water interferes very much with making good work. I like every tile after it is laid to bear my weight without sinking, and this cannot be done in soft places, in the presence of water, and the smaller the tile the greater the necessity for a solid bottom.

“On springy lands that are always wet, and difficult to dig, on account of the tendency to cave in, it is a good plan to partially dig in early summer, as deep as possible; when the water has stopped running, dig a little deeper, and so on till the bottom is reached in the fall, before heavy rains.”

Quicksand.

“But perhaps the greatest difficulty in a large portion of the country to the making of good work, is the presence of quicksand. Much of it is so fine and moveable in the presence of water that it will find its way through the best joints that can be made with tile.

“It is therefore necessary in such places that the drain be made at a time when there is no water present. It is also necessary in order to have a permanent

drain, to dig out the sand two or three inches below the bottom, and fill up with clay, or other material that will not wash. This should be packed solid, and, after the tile is laid, it should be surrounded with several inches of similar material, and well packed. If this is done as it should be, those beds of sand, instead of being an injury to the drain, will serve a good purpose, in bringing water, as laterals."

Size and Depth of Drains.

"Probably the best size of tile for general use is three inches, but where there is considerable water, and especially if the land is very level, say one or two inches to the hundred feet, a larger size will be necessary. In deciding the size of the tile, these two conditions should always be taken into account, amount of fall, and quantity of water. Where the land is such that a good solid bottom can be obtained, two-inch tile, if well laid, in lateral drains of moderate length will answer every purpose. But, in connecting laterals with the main, the discharge should not be on the same level, but through a hole on the top, made for the purpose, which can easily be done by lifting a tile and using a sharp tool.

"According to my experience, the most economical depth for general draining is about $3\frac{1}{2}$ feet. Some writers say 4 feet, but the additional width that must be cut at the surface, in order to get the body in, to lay the tile properly, quite overbalances the advantage of this extra depth. For thorough drainage, at $3\frac{1}{2}$ feet, they must be a little nearer together."

Danger of Silt.

"Another important feature in draining is, that the *grade should be uniform* from the outlet to the head, but the lay of the land is frequently such that this cannot be obtained without running too deep, as the drain goes back. If the upper part is 6 inches to the 100 feet, and the lower part 2 or 3, the danger is that silt will be carried down the steep part and lodge in the flat, and so choke up the drain.

"To overcome this difficulty, the change of grade should be made at a certain point; and there, below the bottom, a tank should be made of brick, the size depending upon the tendency to silt, and the amount of water. The tile above this cistern empties its water into it, and the one below carries it out, leaving the sand in the tank. This point is a favourable one to bring in laterals from both sides. But all those emptying in should be a little higher than the one below, in order to give free discharge. It will also be seen that the tile below should be considerably larger on account of the less fall, and consequently slow movement of the water.

"The tank should be covered with a flat stone, well packed around the sides with clay, and the place marked, so that it may occasionally be cleaned out. It may be marked by objects at different sides of the field, the diagonal lines between which cross each other at this point."

Draining Tools.—Supervision.

"The kind of tools which I have adopted are those which have been approved of in the old country. The spades I have used for many years are made in Birmingham, and cost \$3.50 each. Many of our Canadian spades are entirely worthless, being weak and inferior in material. I have found it difficult to get a good scoop. The best kind I have seen was made from an old drag-saw, riveted by a blacksmith to a handle.

"A very important matter in drainage is the necessity of personal supervision. It is a common thing for farmers to have their drainage done by somebody else, at so much a rod. Probably one-half of the draining done in that way is simply the burying of the tile in the ground, so that in a few years the drain becomes entirely worthless. Every farmer should acquire a certain knowledge of drainage, and should personally supervise every rod of draining done on his farm. Every fall the drains should be examined, with the view of ascertaining whether the water has a perfectly free outlet.

"The only difficulty I had during the last nine or ten years in the way of sand running into the drains, was last spring, when I had to take up a small quantity of drain and lay it again. I believe this success is owing to the method I have adopted in making my drains. Drainage is of little value if it is not well done. I think it will pay to buy the very best tools for the work. I never put anything on the top of the drain except the soil. I make the joints close, and if the tiles cannot be made to fit by turning, I cut them with some tool. Where there is good under-draining there is no necessity for surface-draining at all."

With regard to the cost of under-draining, Professor Brown gives the following as the result of his experience:—

	Cutting.	Laying Tiles.	Filling Drain.	Cost of Tiles.	Total Cost.
	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.
Four feet drain, with four-inch tiles,.....	0 35	0 05	0 05	0 32	0 77
Three feet drain, with three-inch tiles,.....	0 25	0 05	0 04	0 24	0 58
Four feet drain, with six-inch tiles,.....	0 35	0 05	0 05	0 80	1 25

Mr. Gibson's estimate is as follows:—

"With regard to the cost of drainage, when I first put in my drains the cost was not so great as it would be now, because I could then get the best labour for 75 cents a day. The cost of draining the first of my ten-acre fields was as follows:—

30½ days' labour, at 75 cents a day.....	\$22 87½
Board of men.....	8 00
2,400 feet of two-inch tiles.....	17 00
100 feet of one-inch tile.....	1 30
Laying tiles, and filling, 5 cents a rod, for 155 rods.....	7 75
Hauling tiles.....	7 00

Total cost of draining 155 rods \$63 92½

"That is about 41½ cents per rod, which was the actual cost of draining the particular field referred to. I used to be able to get drains dug and tiles put in for 10 or 11 cents per rod; but I could not get it done now for less than about 25 cents per rod. Some years ago, I think I got tiles for \$6, but since then I have paid \$7."

Mr. Cochran, Lanark, says:—

"I like the tile best. The tile is not easily procured. We have to go near to Arnprior for it. It costs \$12 per thousand for three-inch tile. The wood is

cheapest. I put in a wood drain in 1852, and it is running yet. I never could have got such crops as I have mentioned but for the drains."

It would be easy to dilate at almost any length on the advantages of under-draining, but reasons sufficiently cogent to induce every farmer to make a beginning with the best materials and means to hand have already been presented. The difficulty of providing funds without paying too heavy a rate of interest or encumbering an estate, is met by the very liberal terms on which the Government of Ontario lends money for this purpose.

Under the Ontario Tile Drainage Act of 1878 (41 Vic., chap. 9), municipalities may borrow from the Government on 20 years' debentures, bearing 5 per cent. interest, and payable, with sinking fund, representing 8 per cent. in all, in 20 years—sums not less than \$2,000 nor more than \$10,000 in amount, to be loaned to owners of lands within the municipality, for the purposes of tile draining. The by-law for borrowing such money must be passed at a special meeting of the Council, but does not require the sanction of a vote of the ratepayers. Not more than \$1,000 can be loaned to any one person. The Act provides for inspection of the work by a person appointed by the Council, and other guarantees for the proper application and the repayment of the money. It is to be collected from the borrower at the rate of eight dollars for every one hundred dollars borrowed by him for twenty years, unless the amount of indebtedness be earlier discharged. By an Act passed in the following year (1879) (42 Vic., chap. 8), the benefits of the first-named Act were extended to persons desirous of borrowing for the construction of stone or timber drains.

Subsoiling.

The subject of subsoiling was brought under the notice of the Commissioners on several occasions, but in no case more prominently than by Mr. David Caldwell, of Galt, whose name has already appeared in connection with fruit-growing. Mr. Caldwell's evidence in relation to subsoiling will be found in Appendix G.

Successive seasons of drought led Mr. Caldwell, six or seven years ago, to turn his attention to subsoiling. His land is not easy to manage on this system as it is on a stony ridge, and the stones turned up have to be thrown out. He claims, however, that the results fully justify the cost.

The cost of subsoiling per acre, Mr. Caldwell states to be just double that of common ploughing. A span of horses only is necessary, the plough merely stirring the subsoil, not turning it up. The cost of a subsoil plough, he says, is only about eight or ten dollars.

Every farm, Mr. Caldwell argues, does not require subsoiling. Porous, sandy subsoil, for instance, would not need it, but where the soil is a clay loam the effect is very marked. He says:—

"Looking at the fact that the larger number of farmers plough at a cer-

tain depth, and that they keep the plough going at that depth for a number of years, I think it would be a good thing for them to subsoil where possible. Through the horses' feet treading on it and the sole of the plough running on it, it becomes packed like a road and the roots of plants cannot penetrate it. The moisture is retained longer in land that is subsoiled, because the soil is made deeper in that way."

After mentioning the excellent effect that subsoiling appeared to have had on a crop of turnips, Mr. Caldwell goes on to say:—

"The subsoil plough follows the common plough which goes to the depth of about nine inches. The subsoil goes in the bottom of the furrow eight or nine inches. The soil is stirred, say about sixteen or eighteen inches. The general character of the soil I have been subsoiling is clay loam, pretty stiff in the bottom. I find that there is clay, in places, that is very stiff; although it does not retain water it is so stiff that the roots of plants do not penetrate it, and anything that is growing upon it suffers badly from drought. By stirring up this soil with a subsoil plough the plants are enabled to obtain moisture, because their roots go deeper."

The effects of subsoiling on fruit and trees are thus described:—

"I find that the subsoiling makes a great difference in the strawberries. It is also a great advantage to the trees which grow on the land. A crop of apple trees, which it is considered should be allowed to grow four years before they are transplanted, I can grow in three years, by subsoiling, fit to transplant. I think all other crops benefit from it in just about the same proportion. The beneficial results have been, I think, more noticeable in trees than in anything else, for the reason that trees penetrate the subsoil more than grain crops, especially the pear, which is very deep-rooted. Droughty weather has not so much effect on land that is subsoiled, owing to the fact that the stirring of it up allows the moisture which is below to come up."

The beneficial effects on the wheat crop are said to be equal to those already mentioned. Mr. Caldwell says:—

"I arrive at my conclusions as regards the benefits derived from subsoiling, by comparing the results obtained on land that was subsoiled with those on land which was not. I find that it is about equally as beneficial to wheat, and all other crops, as to trees. We are now cutting a heavy crop of clover, seeded down this spring, on where fall wheat grew. In the old country my father was a farmer in Ayrshire, and I remember the first thing he did on some of his land that he improved was, thoroughly to drain and then subsoil it, and that made new fields out of land that was comparatively worthless. My land here is naturally dry.

"I find that grain does not ripen so quickly on land that is subsoiled as on land that is not; it hangs out longer, and the grain fills better. We sold some oats to the miller here, D. Spiers, and he said they were the best that came into the mill. The skin was thin, and the straw was bright and nice. This season we have sold our fall wheat at \$1.06, when the most of the wheat round only commanded \$1.00, \$1.02, and \$1.03—the same kind of wheat. I attribute that difference very much to the subsoiling."

Professor Buckland's remarks on this matter will be worth attention. After strongly advocating under-draining, Professor Buckland goes on to say:—

"It can be laid down as a rule, upheld by all the experience I have ever had, and by all that I know on the matter, that subsoiling or deep ploughing on land that requires draining does no good, but rather harm. The proper method to

follow is to drain the land one year, and the next to cultivate it deeper, or subsoil it. I had a good deal of experience in the cold, wet clays of England, and that is a rule I have universally found beneficial.

“Where land has been cultivated in a shallow and imperfect manner, it has been found safer and more beneficial to adopt deeper cultivation by degrees, and much in this respect will depend on the depth of the soil and the character of the subsoil. I have seen great losses sustained, particularly in the old country, from the neglect of this precaution. As a rule, cultivation in Canada has been and still is, too shallow, but I have observed of late years, among our advancing farmers, a tendency to plough deeper, to the depth in some instances of eight or nine inches, the work being executed in a superior manner, and attended by satisfactory results. The subsoil plough is beginning to attract attention, and its operation in dry land has, I believe, been generally beneficial.

“By subsoiling, I do not mean trenching or bringing the subsoil to the surface, but merely loosening it.”

Mr. James Thomson, of Brooklin, has also tried subsoiling with good results. He says:—

“I have tried subsoiling with good results, using one plough after another, as I have never seen a subsoil plough that suited me. The object is to loosen the soil, not to turn it up, as it is apt to become packed below, and roots, instead of striking downward, branch off laterally when they come to the subsoil. The effect upon root crops especially is very marked.”

The question of subsoiling is by no means a novel one. The foregoing evidence is quoted merely as a fresh contribution from intelligent and practical observers to an interesting branch of inquiry. Enough is said even in the brief compass here devoted to subsoiling to show, first, that it may be at times exceedingly beneficial, and secondly, that it should be resorted to only under certain conditions, and with proper caution.

CHAPTER IX.

DAIRYING.

The progress of dairying in Ontario and its beneficial effects on the agriculture of the country have already been mentioned. The rapid development of the cheese producing branch of the dairying industry has been most surprising. In 1857, 1858, and 1859 the exports of cheese from Canada,—probably of a local character only to a few places in the States, the Reciprocity Treaty being then in force,—were 124 cwt., 117 cwt. and 323 cwt., respectively. In 1860, 1863 and 1864 they were 1,110 cwt., 466 cwt., and 1,138 cwt. The highest money value of the exports in any of the above years was \$16,199. In 1879-80 the exports of cheese from Canada amounted to no less than 43,441,112 lbs., the declared value being \$4,094,046, or nearly ten cents per lb., in a year during a portion of which prices were unusually low. Of this 40,368,678 lbs. was the produce of Canada,—3,000,000 lbs. of American cheese apparently finding its way to a foreign market from Canadian ports,—only 106,815 lbs. of imported cheese, valued at \$11,729, being entered for consumption in Canada. In 1859 Canada imported 857,951 lbs. of cheese, paying for it \$97,998, and, in 1864, 746,480 lbs. weight of cheese valued at \$80,532.

The Commissioners have had little difficulty in discovering to what causes the success of the cheese-making, and the less gratifying results of the butter-making branch are respectively due. And they have the satisfaction of knowing that no causes other than those the intelligent exertions of the farmers of Ontario may easily overcome, stand in the way of a trade being secured for butter as large and promising as the foreign market for cheese. The latter industry will be first noticed.

CHEESE.

The manufacture of cheese in factories instead of private dairies may be said to have been inaugurated in Western Canada by Mr. Harvey Farrington, of Herkimer County, New York, who settled in Oxford County, Ont., about the year 1864. Most persons will to-day agree with Mr. Ballantyne's remark, made in the course of his evidence, that, to Mr. Farrington, a deep debt of gratitude is due for his efforts in the establishment of this—to Canada—new industry. In the year 1866 a great extension of the cheese manufacturing system took place in the western counties. In that year, too, as mentioned in his evidence, Mr. Ketcham Gra-

ham, after visiting the dairy districts in the States, put up the first cheese factory in the County of Hastings, now one of the greatest cheese-producing centres in Ontario. The township returns give over five hundred cheese factories as being at the present time in existence in this Province, and it is probable that nearly, if not quite five hundred are actually in operation. A large number are carried on upon co-operative principles by the farmers themselves. Others are worked either singly or otherwise by large manufacturers, and some, conducted by private persons, are designed to meet the wants of districts where the population is sparse, and only a limited number of patrons, consequently, can be found to share in the benefits. All these are represented in the evidence to which—so far as manufacturing details are concerned—those most directly interested are referred. The main requirements of cheese factory operations are, in fact, now so well understood that it would be almost a work of supererogation to repeat them in this place.

Mr. D. M. Macpherson, of Lancaster (Glengarry), who was examined as a witness, is running no less than thirteen cheese factories at the present time. Mr. Macpherson receives one and-a-half cents per pound, which covers, he says, “all the work of manufacturing, selling, boxing, keeping the books and paying the dividends, everything, in fact, except drawing the milk. His operations cover an area of about eighteen miles square and utilize the milk of some 4,000 cows. By the system of concentrating the management of so large a number of factories in the hands of one person, a uniform standard of quality is secured, the want of that uniformity being almost the only defect in the Ontario cheese manufacturing system. Mr. Macpherson says on this point:—

“One of my greatest difficulties has been to get the cheese of the different factories at a uniform quality; in that effort I think I have succeeded more this year than ever before. In order to attain that object generally throughout the country, I think it is better that one practical person should have the management of a section of factories, than that each factory should be managed separately. I think that system of management would be as great an improvement on the present factory system as the factory is on the private dairy. It would raise the standard of cheese everywhere. The great complaint at present is that there is a want of uniformity, as well as a great deal of inferior cheese.”

Mr. Ballantyne alludes to the same subject at considerable length. He says:—

“I am much impressed with the fact that, if one man was to have the management of a number of dairies, it would very materially raise the standard of our cheese. Dairying has been long carried on in Herkimer and Oneida counties, New York, and it was from there that the factory system extended to Western New York, Pennsylvania, and Canada.

“In Western New York there was a small proportion of the factories that were very successful, but some of the men who were successful have bought out the other factories, one by one, until there is what we call the Western New York Combination, one man owning twenty, another man ten, and so on, and nearly all the cheese is manufactured in that way. The change in the system has entirely altered the character of their cheese, and it now ranks very much higher than the cheese which comes from factories under separate and varied management.

“As the result of trials showed, we have cheese superior to theirs, but there

are many factories which would, doubtless, be greatly improved if this system were adopted. We have many factories making a poor or medium cheese, whereas, if they were put under the management of competent men, they might all produce a uniformly fine quality of cheese.

“These factories go on making cheese from year to year, the men in charge probably imperfectly understanding their business, but working along, seeing that something in the process is not right, but not knowing what it is, whereas a skilled cheese-maker could at once detect what was wrong and apply the remedy. I have seen very many illustrations of this, and I have endeavoured myself to do a good deal in the way of educating dairymen to a proper understanding of their business. I have always regretted that this matter has not been more strongly urged. When I was in New York last fall, and driving among the factories of these combinations, you could scarcely tell the difference of quality in any single cheese of their product, but we have no such uniformity here. Then they are able to buy the articles required in large quantities, and they get them cheaper, and being better judges of them, are less liable to be imposed upon.”

In answer to questions put to him as to the practicability of the system above referred to, Mr. Ballantyne said:—

“There would be no difficulty in getting such an arrangement made, if the factories realized that their interests were largely identical—that all are interested in improving the quality of the cheese, and that every pound of poor cheese diminishes the value of the whole product. Of course there is likely to be some jealousy among people in the same line of business. Some men are quite willing to have the reputation of making better cheese than their neighbours, whereas, if their neighbour's cheese was as good, they would certainly be getting a higher price. Companies might manage their own business, and have men to do the manufacturing.”

Speaking generally, this seems to be the one thing necessary to make the reputation of Canadian cheese absolutely unassailable. Even as matters stand at present, however, there is every reason for satisfaction with the position Canadian cheese—and that means, with a very small exception, Ontario cheese—holds in the British market. Mr. Ballantyne, who has the very best opportunities for forming a judgment as to the estimation in which Canadian cheese is held, both on the American continent and in Europe, says:—

“I may mention that, in 1878, there was an International Dairy Fair. Indeed, we might go back even to the Philadelphia Exhibition, where the finest cheese exhibited was that from Canada. But in 1878 there was an International Dairy Fair in New York, where there was cheese from every cheese-producing State in the Union, from Canada, and from England, both Cheshire and Cheddar. Well, the sweepstakes prize was given that year to three English Cheddars, from Bath, England, the judges mentioning that the next best were three Canadian cheeses, which I had the honour of selecting.

“Last fall a similar exhibition was held there, which lasted for two weeks, and there were a great many entries of English cheese of both kinds. The sweepstakes prize was given to three Canadian cheeses.”

While it is possible, Mr. Ballantyne thinks, that in England a small quantity of Cheddar cheese is considered superior to the best Canadian, he holds the opinion that our best fall cheese—that made in the latter part of August, or in September or October, would obtain a higher price in England than eighty per cent.

of English Cheddar. In support of this view Mr. Ballantyne mentions an incident that once came under his notice. He says:—

“Looking at a lot of Canadian cheese which I once shipped to a gentleman in London, I asked him how they would compare with the finest English Cheddars. He said he did not know where he could buy a ton of as fine English Cheddars, though there was a limited quantity supposed to be finer, but it would sell at a higher price.”

A very considerable assistance to the cheese industry has been given by the Associations of Dairymen, now existing as incorporated societies in the Province, and holding their conventions annually for the discussion of matters of common interest. If there has been anything wanting in the proceedings of these bodies, it is that they have directed their attention too exclusively to cheese, and left the sister interest of butter to take care of itself. Mr. Ballantyne, however, appears to hint at some change in this respect. After all, the question whether Canadian cheese shall maintain the ground it has now secured must be determined by the dairy farmers of Ontario themselves. Cheese-factory managers and directors will be glad, no doubt, to read every word of the evidence of such men as Mr. D. M. Macpherson, as to the mode of conducting operations within the factory itself. But the patrons have their duties too, and be they ever so honest, unskilfulness or negligence on their part must always thwart the efforts of the most able and experienced manufacturer to turn out a really first-class article. Between the advice given by Mr. Malcolm in the paper he furnished at the request of the Commissioners in this regard, and the evidence of Mr. D. M. Macpherson, it is hoped the whole duty of the dairy farmer will be found to be fully set forth. The best kind of cattle for the ordinary dairy farmer has been already indicated, but a few points relating to the management of the cattle may here be usefully noticed. First, Mr. Malcolm urges the importance of warm and well ventilated stables. He says:—

“A certain amount of heat must be kept up. If this is not attained by good walls, the cow uses the food she eats for that purpose. If those that are behind in this matter could only see their animals burning their food in order to keep warm, they would open their eyes to the importance of a good stable, and would, no doubt, soon procure one. It is now becoming very common to build such stables as a basement under the barn. They are cheap, convenient, and in every case answer the purpose admirably.”

In the next place, the food must be liberally administered. Mr. Malcolm says:—

“But, as I before remarked, the cow is a machine for turning food into milk, and it matters not how good the machine is, it cannot work without material to work upon. Just how to feed in order to realize the largest profit is a question on which there is a diversity of opinion. Some think it pays to feed corn, bran, and chopped stuffs. Others are of a different opinion, but are satisfied with a smaller quantity of milk, if it is made from unmarketable produce and pasture; almost everything is sold that will bring money, except hay, and a few will go even the length of selling that, to such an extent at all events, that the cows are simply kept in a *living* condition.

“Now, those who feed beef cattle know, that, if they do not give their

cattle more than will merely supply the requirements of life, they will never make beef, and it is just so with cows; it is the extra food over and above what is actually required to keep the machine in working order, that can be turned into milk. The dairyman that is afraid to put in this extra food for fear he will never see it again, is like a miller that, after being at the expense of building a mill, is afraid to buy wheat to grind in it. As far as theory is concerned, one would think that if all the profit is derived from the extra food, the more of it the better. But to judge from the practice of many, it is evident they are unbelievers."

Mr. Macpherson, on the same point, says :—

"Great improvements have been made in stables the last few years since factories were introduced, farmers having devoted more attention to housing their cows, keeping them comfortable, and feeding them well. There are different kinds of stables, but the cows are generally tied with chains, very often facing each other with an alley between them. Stables are generally frame, closed in and made comfortable and warm, and well ventilated. There is not much bran or chopped feed used now, though considerable is used when the cows come in. Farmers are cutting their hay earlier than they used to, and when they do so their cows do not require so much grain. There is not much summer feeding. I consider corn excellent green feed for cows during the last of July or in August. I do not know that it increases the flow of milk, but it keeps up a uniform flow and also keeps the animal in good condition. There is not much permanent pasturing laid down in the section. It is generally broken up after about three years' pasturing. Grass is the natural food for the production of milk. I have had some experience in bran feeding, and I find that it has not nourishment enough. It excites too much milk at the expense of the cows' vitality. A mixture of oatmeal and barleymeal with bran is good."

All the feeding in the world, however, will not secure an abundant supply of milk from every cow. If the dairyman is careful to raise his stock from a good beefing strain, such as the Durham, he will not have so much occasion to put up with inferior milkers. Every one of the latter should be turned over to the drover or shipper as early as possible. Mr. Malcolm says in this connection :—

"Every dairyman knows that the difference in cows is such, that, while one will make a good profit, two others will simply pay for their keep. The Hon. Harris Lewis, a very prominent American dairyman, declared in a speech at Ingersoll, that this was about the ratio of paying cows in the United States, and most likely it is no better here.

"Now, as he said, we should endeavour to have our herds composed of *third* cows. A cow that will give 7,000 pounds of milk in a year is a cheaper cow at \$80 than a cow that gives 3,000 is at \$20. I cannot take space to figure out the difference, neither is it necessary; every dairyman knows that, while the one is a mine of wealth, the other is not worth keeping, still there are many such in the country. The only remedy is careful breeding and selection. No one can hope to get a good herd of any considerable number all first-class, but a continued effort in that direction may result in what might be termed good."

Mr. Malcolm does not give any very exact information as to the average annual revenue per cow. As in beefing so in milking, he looks chiefly to the profit on the feed, as between its cost and market value in the shape of milk or beef, when consumed by the stock. He is in favour of bringing his heifers to milk early, and says :—

“So much am I in favour of bringing them to milk at two, that I would not raise a heifer if I knew she would not milk before she was three. I believe in cows milking, not only early in years, but at least nine months every year.”

As to the yield per cow, Mr. Malcolm remarks:—

“As regards milk, my herd of 16 will, this season, average about 6,000 pounds of milk or 600 gallons, and many others with like cattle will do similar work. However, this is a good season for pasture, and the quantity of milk is above an average.”

Mr. Macpherson says on this subject:—

“About 450 or 500 pounds of cheese is the highest average per cow in any one herd. They were a select native stock with perhaps a sprinkling of Ayrshires and Durhams. Three hundred is a very good average, but these cattle were very well cared for and well selected.”

He gives the following as the points in a good dairy cow:—

“A good dairy cow should have a pointed head and neck, loose skin, wedge-shaped body, rather preponderating in weight towards the hind quarters, having rather a heavier appearance from a side view than in front, a slim tail, a large udder, and a docile eye.”

Cost of Food, and Profits.

In regard to cost of food and profits, Mr. Malcolm says:—

“It will not be far from the mark, to say, that a cow that will give on an average \$40 a year will require, at market prices, \$35 in food, leaving only \$5 to pay for care and milking.

“But the profit is obtained, in the first place, by producing the food at less than the market price, and selling it through the cow, at the same time saving a large portion of its fertilizing value to the farm.

“In the second place, there is a profit secured by making use of the pasturage on land not fit for cultivation, also of bulky cheap produce, such as chaff, corn-stalks, turnips, etc.

“In fact the cow should be looked upon as a medium, or machine, by which not only the coarse, cheap, bulky, and unsaleable fodder may be turned into cash, but much that is of value, such as corn, peas, oats, barley and hay, be marketed at remunerative prices.”

Proportion of Cheese to Milk.

Then as to the proportions of cream or of cheese to milk, Mr. Macpherson says:—

“From 14 to 16 per cent. is the standard of cream in good average milk. We cannot judge each man's milk from one common standard; but we get a standard of the quality of each man's milk, and judge what we shall get from him in the future. Some herds give richer milk than others, and we have to take a medium average of all.

“In estimating specific gravity we allow from 95 to 100 for good milk. Fresh morning milk will not show as high a specific gravity as the night's milk. If the milk was diluted I would make a variation of from 5 to 6 per cent.

“The average amount is about ten pounds of milk to a pound of cheese, and the average is becoming more and more every year. We took more last year than ever before, because we had to make a dryer and firmer cheese. It is not possible

to make a fine cheese for export on a less average under existing demands of the market.

“The latter part of the season has quite an advantage over the fore part in reference to the yield—the milk is much thicker, and there is a larger proportion of the solid parts of the milk in the fall than in the summer—from 5 to 15 per cent. more. The month of June will give a better yield than May, and July and August generally fall behind June. I cannot account for this. I know that in June we always get a slightly better average than in July, and in the latter part of August, September and October there is an improvement right along.”

Mr. Macpherson, it will be recollected, is making cheese in a district where progress in improving stock has not been so rapid as in Oxford, where Mr. Malcolm resides. The latter speaks of 6,000 pounds of milk per cow as the result of a rather exceptionally good season. That represents, at Mr. Macpherson's estimate, 600 pounds of cheese per cow. Mr. Malcolm, however, probably would not regard 450 pounds as an extraordinary yield.

Mr. Daly, of Thurlow, Hastings, gives the following as his experience :—

“I obtain on an average about \$30 per cow for the milk sent to the factory, and besides this I make between 400 and 500 pounds of butter, or about \$6 per cow. The calf is worth \$1, or if kept till fall, \$5 or \$6, making about \$40 per head as the average proceeds.

“I do not feed my cows over one ton of hay each per annum, which costs \$8 or \$9. The pasture costs about \$6 for the season, and \$1 will pay for the meal. I calculate that the manure is worth, at least, as much as the straw, so that \$15 or \$16 would be about the total cost of keeping a cow. I do not raise many calves, but supply myself by purchasing.”

Management of Dairy Cattle.

In regard to the milking and handling of cattle, Mr. Malcolm says :—

“A great deal might be said on the *general treatment* of cows, but my remarks are already too long. Sufficient to say that, after comfortable stabling, liberal feeding, and abundance of good water, kindness should rule. No kicking or clubbing, no driving with dogs. Everything should be done to keep the cows placid and quiet. All excitement will reduce the quantity of milk and otherwise injure it. Every cow should be a pet, that will not step out of your way, but require you to go round. A little patting, stroking, and currying I believe will pay. But as I said before, we don't practice as well as we know.”

Treatment of Milk.

In the treatment of the milk the first essential is absolute cleanliness and the absence of anything that will taint or contaminate. Mr. Malcolm says about this important matter :—

“I have no space to speak of the necessity for cleanliness in milking, but here is where the great danger from impurities lies, and not only from actually filthy material, but from offensive odour in stables. It is utterly impossible to bring pure milk from a rank-smelling stable. Nothing will absorb those odours quicker than warm milk : great care should therefore be taken to ventilate before milking, and to remove the milk as quickly as possible to pure air.”

Mr. Macpherson goes further into detail on the same point. He says:—

“The first steps taken in organizing a factory are of great importance, especially the educating patrons to see the necessity of delivering their milk in proper condition; keeping the cans clean, and giving it the greatest attention possible. The milk is delivered in the morning of each day. Great attention is paid to having the milk aerated before being sent to the factories. That is a point which I impress very strongly on my patrons. It should be aerated while the milk is fresh and warm, as this drives off the injurious gases more easily. When it is properly aired it should be cooled down to about 65 degrees to preserve it from souring. That has the effect of preserving it pure in flavour, and the chilling keeps it pure with regard to sweetness, and these are two very desirable qualities in good milk. I like to get it into the factory as early as possible.”

Mr. Macpherson is much in favour of the milk being drawn only once a day, and one reason for this is that it gives an opportunity for the milk to be aerated at the farm which can be done better and more effectually than at the factory. The process of aerating is as follows:—

“Milk, before being cooled, should be aired for from fifteen to twenty minutes, with a dipper, immediately after it is milked. It is very important that it should be aired while it is warm. It is much better to cool the milk at home, also, than at the factories. Being distributed in smaller quantities, it can be cooled much quicker; it can be aired immediately after it is milked, which is the proper time, because the injurious gases then pass off in vapour, whereas, if the milk was drawn to a factory before it was aired or cooled, these gases would be retained in the making. You get a finer flavour and a finer quality of cheese if the milk is cooled at home, everything else being equal.”

He says, further, on the same point:—

“It does the milk an injury to cool it immediately, but by following the directions I have given, we get rid of its animal odour. This odour is very volatile, and when the milk is warm it rises in vapour, but if you cool the same milk without aerating it the odour can be perceived whenever it is warmed up again. I have no trouble in my new factories in getting the patrons to take proper care of the milk, because they can be started on a right basis. One factory that I have rented was badly managed before, and the patrons got into a loose habit of caring for their milk and I find a great deal more trouble with them than with any of the others. If an injurious flavour is left in the milk it is a fixture and you cannot eradicate it.”

The manner of cooling is thus referred to:—

“As to the method which I would recommend to patrons of cooling their milk who keep it over night, I would approve of using a plain long-handled dipper to aerate the milk, and setting the can in a vessel containing double the amount of cold water that there is milk in the can. Some of my patrons use a square box or a round tub, but it is a safe guage to go by to have the vessel contain double the amount of cold water that there is milk in the can, and the water should be fresh from the well or spring. In that way you will reduce the milk from 90 or 95 degrees to 60 or 70 degrees, which is a sufficiently low temperature for good satisfaction at the factory.”

Small Private Factories.

Before turning to the subject of butter it may be interesting to notice briefly the evidence relating to small private cheese factories of which two in the County of Leeds were visited recently by Mr. Byrne, one of the Commissioners.

In the districts referred to, a good deal of dairying is carried on. The country, contiguous to the waters of the Rideau, affords fine pasturage and great facilities for either cheese or butter-making. Mr. Myers, one of the persons visited, had formerly a partner, but has now for some years worked the factory alone. He keeps forty cows and makes cheese for any neighbours who like to deliver their own milk. His factory cost the modest sum of about \$450, "exclusive of his own work." His views of the advantages to himself of his system are expressed as follows:—

"I derive several advantages from having a cheese factory on my own farm, beyond what I did when I sent my milk a distance to get it made into cheese. 1st. I save \$1 per ton for hauling milk. 2nd. I put in one extra mess of milk in the week. 3rd. I now feed my calves on sweet whey; they do well on it without any other food. 4th. My hogs are now fed on sweet whey, and each of them will (provided I keep the same number I formerly did) make 100 pounds more pork in the fall. 5th. I manage it cheaper—have my milk come in in better condition—and I flatter myself that I make better sales from having a better article to sell.

"All these considered, I now realize full \$15 per cow more in the season than I did when I sent my milk to be manufactured at the cheese factory I was running in company."

Mr. Myers' views as to the advantages of small factories over large ones, may not be those of most people, but they deserve none the less to be noticed on that account. He says:—

"I think that the system of small cheese factories is the most profitable to the community. They can be more economically managed in the first place; secondly, the profits are more equally distributed among the people, and therefore do more good. The first year that I ran this small cheese factory I paid those who patronized me 2 cents per 10 pounds of milk more than other neighbouring factories did. The next year one-half cent more; this season I am able to pay 1 cent more. My cows have paid me while I was making cheese on an average, \$38. Before commencing cheese and after stopping, \$8. Total, \$46. This has been a favourable season for cheese-makers, and prices have been good."

Mr. Myers is a very intelligent man; he understands cheese-making, no doubt, thoroughly; he throws his whole heart into the business, and he succeeds in serving himself and in helping others. But, while small factories may be a necessity in thinly-populated districts, they will hardly be substituted for larger ones where the circumstances for the latter are favourable; for all experience goes to show that it is only by combination, and that on a large scale, the best results can ordinarily be secured, and the general standard of quality maintained. Mr. Myers makes a little more cheese to a given quantity of milk than Mr. Macpherson professes to obtain. He says:—

"I averaged this year one pound of cheese for every $9\frac{1}{2}$ pounds of milk. This is something better than many others do. I attribute my success in this department to cleanliness, economy, prudence, and care in saving the milk, allowing none to go to waste, even the smallest particle, and in handling the curd, not touching it until it was in proper order, and then in not handling it so roughly as to divide it into too small particles, so that it might run off in the whey."

Perhaps some other persons following Mr. Myers' system may be instructed by knowing precisely what his process of manufacturing is. He says on this point:—

"This is my mode of doing business: After the milk is weighed it is run into the vats, then cooled to about 70 degrees to take out the animal heat, then heated to 80 degrees. Then put in the rennet, leave it till it coagulates, which usually takes about fifteen minutes. Then let it stand for about one and a-half hours. When it breaks off clean it is ready to cut. Then cut with a curd knife. After cutting let it stand until the whey rises. Then cut a second time, then it is ready for cooking. Cook to about 98 degrees; then let it stand until we can see what is called 'messengers;' then run off the whey. The curd then all settles down. Then cut with a common knife into chunks; the whey then all runs off. Then let it stand until the proper change takes place—the time often varies.

"This is the particular time that judgment and attention are required in the cheesemaker. A neglect of a few minutes will make bad cheese. When testing it to know when it is ready to grind, by putting the curd to a hot iron and pulling it off again, it is considered good when it will string out into very long fine threads of a silky nature. Then grind fine with a curd mill; then it is ready for salting. Salt with good salt, with from $2\frac{1}{2}$ pounds to 3 pounds to the 1,000 pounds of milk. Salt evenly and put into hoops. *Press well until the whey is all out.* Put on the shelves and turn regularly, and keep the room if possible at an even temperature until it is properly seasoned."

The other witness, whose statement was taken by Mr. Byrne is Mr. John Gile, already alluded to in a previous chapter, as having once kept a flock of Merinos, and still believing they might be successfully bred in Canada. Since he disposed of his sheep, Mr. Gile has gone into dairying. He owns ninety-five cows and expects to milk one hundred next summer. His farm is an extensive one, 750 acres, with 600 acres cleared and under cultivation. He makes both butter and cheese for himself and patrons, charging for making cheese $1\frac{1}{4}$ cents per pound, when the milk is delivered, that amount including the boxing of the cheese; but it is hardly a remunerative compensation. In cheese making, Mr. Gile finds 100 pounds of milk make 10 pounds of "full cream cheese." This he sold last year for $11\frac{1}{4}$ cents per pound, leaving the farmers a net sum of one dollar per 100 pounds of milk.

Cheese and Butter Combined.

The practice of making butter and cheese together finds favour with Mr. Gile in point of profit, although it is doubtful whether the reputation of Canada as a cheese making country would be strengthened by any large exportations of skimmed milk cheese. However, here are Mr. Gile's figures:—

“The 100 pounds of milk made into butter and cheese make 3 lbs. of butter and 7 lbs of skim cheese. The butter was sold for 25 cents per lb., or 75 cents; the cheese at $8\frac{1}{2}$ cents; total $134\frac{1}{2}$ cents, from which we must deduct $3\frac{1}{2}$ cents per lb. for making butter, which leaves a balance of $24\frac{1}{2}$ cents in favour of the combined system of butter and cheese, on every 100 pounds of milk. This is what has been done this season. Our experience has been short, but we think a little better can be done when we get more conversant with the business. The cost of changing the cheese factory into a cheese and butter making establishment was about \$1,000.”

The method of making the skimmed milk cheese is thus described by Mr. Gile :—

“The buttermilk and skim milk are put into the vats and heated to 80° , then the rennet is put in allowing it to stand 30 minutes. The curd is then cut with a curd knife and stirred a short time before beginning to cook. This is cooked to 88° and stirred, and the whey is run off. It is then allowed to stand for the acid to form, and until it flakes or threads finely with a hot iron. The curd is then ground with a curd mill, salted evenly with about 3 lbs. of good clean salt to the 1,000 pounds of milk; then put into the hoops and pressed well until the whey all runs off. A bandage should be put on the bottom and top of cheese as well as on the sides; it would help to ward off enemies that are often troublesome in hot weather, and which prevent the proper curing of cheese.”

Cheese as an Article of Diet.

Mr. Gile's method of making butter may be noticed presently. Meantime, as everyone should do his duty in encouraging so noble a Canadian industry as the manufacture of cheese, it may not be out of place here to quote Professor Bell's views upon cheese as an article of diet. Professor Bell says :—

“Referring to the dairy system, I strongly approve of cheese as an article of diet. A given quantity of cheese contains more actual food than any other article of diet we are acquainted with. It is best when it has just fairly ripened, and it is not desirable to use very old or strong cheese, otherwise than as a condiment. I think Canadian cheese is generally superior to English in its digestibility and and its nutritious qualities. All cheese should be used with a large proportion of farinaceous food.”

The Commissioners can hardly conclude their observations on cheese more appropriately than, on the strength of the Professor's opinion, advising everybody to eat more cheese.

BUTTER.

It would be extremely gratifying to the Commissioners to be able to speak with the same assurance of the butter-making branch of dairying in Ontario, as of the sister industry of cheese manufacture, although with an exportation in the year 1879-80 of 18,887,703 pounds weight, of which 18,535,362 lbs., valued at \$3,058,069, was the produce of Canada, it is evident that the foreign butter trade of Ontario is not to be despised or its expansion and increase doubted.

And, from the evidence before the Commissioners, they have no hesitation in saying that, inferior as some of the butter sent from this Province is, a very high class article is no longer unknown, and that only an intelligent determination to consult their own interests as well as the wants of the market, on the part of our dairy farmers, is needed to make Ontario as fine a butter-producing country as any in the world. As, however, it is always wise to face the difficult and disagreeable at the outset, the indictment formulated against Canadian butter by several of the witnesses, will be first noticed.

Defects of Canadian Butter.

In his report on experience gained during a trip to England last summer, Mr. Richard Gibson, one of the Commissioners, states as follows:—

“Along with Mr. Dyke, Dominion Agent, Liverpool, I called upon some of the largest American produce importers. We were kindly received, and every opportunity was afforded us of examining and testing the different brands of cheese and butter.

“The best makes of butter are from the Western States; a splendid consignment had just arrived from Illinois; we examined several kegs and found them uniform in quality, taste and colour; in fact, as the merchant observed: ‘One is a sample of the lot—I can send the whole of that consignment out to my customers with perfect confidence, without opening a keg, they are always alike.’

“Upon asking to see some Canadian, several kegs were opened, but not one was uniform, except, I am sorry to say it, uniformly bad—soft, bad-flavoured, and of different colours.

“Upon asking the question—‘What is our remedy?’ ‘Your only remedy is to establish creameries; formerly butter from this very district,’ pointing to the lot from Illinois, ‘was no better than yours—now it is the finest brand imported into Liverpool—better than any we get from Ireland.

“‘Again, you must use fine English salt—your American and Canadian will not do if you wish a slice of this trade; and there is another thing I want to call your attention to, and that is the kegs.

“‘Look at those, all nicely planed *inside* as well as out, so that when a keg is inverted on the marble slab generally used here, the butter comes out nice and in one piece. Yours are rough inside and the butter is broken; all these little things add to the market value; you must please the eye.

“‘Now look at that consignment forwarded by one of your Montreal steamers, and this one by a New York line. That looks as if it had been stored in the ship’s coal bunkers; this, as if the Steamship Company were alive to their interests. We scarcely ever get a dirty keg by the one line, and as seldom a clean one by the other. Now the difference of appearance even in the kegs makes a difference of cents a pound.

“‘Again, when your people have a really good article, whether of cheese, butter, apples, etc., tell them to get a nice attractive stencil plate and don’t be afraid to let the world know where such an article was produced. Little mean plates with ‘Ont.’ in one corner—do you think people over here know what that means! Now if you would put ‘Canada’ on in large letters, they would understand something about where it was produced.’”

That the speaker in this case was not merely endeavouring to discourage a Canadian trade is clear from the very practical suggestions made as to improve-

ments. His remarks as to Canadian salt will be fully noticed elsewhere. Meantime, no one need attempt to deny that a good deal of butter has been shipped to England worthy of all the disparaging observations, as to want of uniformity in colour and quality, rough kegs, careless shipping, and the little word, "Ont.," which, possibly from a patriotic desire not to prejudice either Province or Dominion by fathering upon it an inferior article, some worthy shippers of the same may have intentionally substituted for the bolder designation.

The next witness to be put on the stand is Mr. Andrew Broder, M.P.P., of West Winchester, Dundas, one of the largest buyers and shippers of butter in Ontario. Mr. Broder says:—

"Another great trouble with Canadian butter is that it lacks uniformity. The people of England are very particular as to the appearance of the article, and even the appearance of the package has a great deal to do with its sale, far more than it would have with us. We find, in collecting a shipment, that we have large and small packages, some clean, others seamed and discoloured, and when we get 1,000 packages with such a variety of appearances they make a very unseemly lot of stuff. The proportion of fine butter is really limited.

"The Irish butter trade is not in so unsatisfactory a state. They can pack in a more inferior package than we can, and it comes out better. The Dutch and Danish butter is known on the market by the appearance of its packages.

"If we were to adopt a particular form of package, and it became known as Canadian butter, I think it would have a decidedly favourable effect. I have had letters from my agents in England particularly requesting me to send a special form of package.

"It would be a great improvement to the trade if our store-keepers would stop trading in butter and allow it to be sold altogether for cash. Fifteen years ago we had just as poor butter in our section as anywhere, and the trade was carried on a great deal as it is now in the west, but buyers came and bought according to quality, and the result was a great improvement in the quality.

"When I am paying for butter I always tell the people when anything is wrong with it, and I think buyers are very much to blame themselves for the bad quality of butter. The store-keepers dare not tell the farmers' wives about the quality of their butter, but I find that people are anxious enough to find out the proper way of treating it."

It will be seen that Mr. Broder, with honourable frankness, tells the same story as the merchant quoted by Mr. Gibson.

Mr. John Inglis, now of Chicago, but formerly of Teeswater (Bruce), and the originator of a creamery there, says in his evidence:—

"We did not think we could realize the price we afterwards did get for our butter, because twenty-five cents a pound was looked upon at that time as an extreme price. I was then keeping store. I had been in the habit of buying butter largely, but my experience of buying and selling butter before starting the creamery was not satisfactory. When we bought butter, it generally came in from the farmers, over-salted, and of poor flavour; and when we took it we had to select it according to colour as best we could; and the business was generally attended with loss, especially to the country merchant. Country merchants are in the habit of cultivating a trade with farmers, and they are willing to pay a premium on their butter for the sake of getting their trade. During the period I was purchasing butter from the farmers, its price varied from 12½ to 18 cents."

Mr. Inglis let in a little additional light, too, on the causes of Canadian butter being too often of a very inferior quality. He says:—

“There are very few farmers’ wives who ever think of using a thermometer with the churn. Sometimes the butter will churn in ten minutes, and sometimes it will take five or six hours. Another reason why dairy butter is poor and of uneven quality is that farmers’ wives take the milk and skim it and put the cream in a crock; the next night they do the same, and continue doing so until they have sufficient for a churning. The consequence is that the cream has not the same consistency, some of it is acid and some is sweet; it has not all ripened. It is placed all together in the churn, without any regard to the temperature, and sometimes it comes out white, curdy or stringy, and they are never sure what they are making. Cream requires to be ripened. The uneven quality of our butter arises from ignorance of the process of making butter, and the want of attention to details; and Canadian butter is generally too much salted for the English taste. Butter with half-an-ounce of pure pulverized salt to the pound suits the English market best. That is half the quantity the United States dairymen use. But we beat the American butter in the English market the year before last. At first we salted it with an ounce to the pound, and could not get the price. The next season we salted with half-an-ounce, and it was much finer and brought a better price.”

Mr. Edward Cash, of Seaforth, a very experienced dealer in butter, points to similar drawbacks in his evidence. He says:—

“My experience as to the general character of the butter products in this district leads me to think that one fruitful source of poor butter is owing to many parties attempting to make butter from too few cows; keeping the cream too long, and having too many churnings in one package of butter. Butter made in the hot season is generally poor. Dairies of eight or ten cows, and churning every twenty-four hours, other things being equal, the butter will be equal to creamery. Of late there has been a decided improvement in the quality of our butter, owing to the better education of the people in these matters.”

Mr. Robert Meighan, a large buyer at Perth (Lanark), says:—

“I believe one reason of inferiority is, the farmer here has not been taught to improve his butter by the merchants who were reluctant to tell him his butter was inferior. We examine it carefully when it comes in and appraise it accordingly. There has been a decided improvement lately in the butter of the section. I think the low prices of late years, and public attention being called to the subject by the press, has led to improvement. We get our best butter from the high lands.

“Careless making is the chief cause of complaint. The buttermilk is not taken out, too much salt is used, and the colour is not regular in the same package. There are no creameries in the neighbourhood.”

The last mentioned witness, it will be observed, is from a very favourable district. The condition of the butter made in Western Ontario is, it may be concluded from the evidence, worse than in the eastern sections. Mr. Broder says on this point:—“From our own (eastern) section we have two brands; and from this (Toronto) I have sometimes found it necessary to make four. . . .

“There is a difference of about 4 cents a pound between Morrisburg butter and Western Canada butter, that is on the round lot. I have sold ours at 125 shillings at the same time that I was selling butter shipped from Toronto at 98. The butter at 98 was graded A, B, and C. We get on an average about 3 cents a pound more for creamery butter than farm-made butter.”

In the counties Mr. Broder refers to as the eastern section, butter dairying has

been to so large an extent the dependence of the farmers that they have almost of necessity adopted the counsels of Mr. Broder and others, and, aided by considerable natural advantages for that business, have made butter that ranks fairly well in the British market. In the western counties, dairying, wheat-growing, stock-raising, and factory cheese-making have received the first attention from the agriculturist, and the butter-dairy has been a little thrown into the shade. Of Canadian butters, that from the Eastern Townships ranks highest, closely followed by Morrisburg, and that again by what is known as the Brockville brand, the places mentioned representing pretty large districts, of which they are the centres. The Brockville brand has long been famous for quality. Mr. Meighan, of Perth, which comes within the general term of the Brockville district, says:—

“Butter varies much in quality. We can sell all the good butter, but the poor quality is a drawback. About two-thirds would be our best shipping brand; the rest would be seconds and thirds.

“Our best brand is well known, and stands well in the English market. We can place it by cable on its own reputation. It brings the highest price of Canadian brands excepting the Eastern Townships and Morrisburg. Brockville brand has fetched lately 115 shillings per cwt. Our best brands are not so even in quality as the Townships, or even the Morrisburg.

“I believe the quality of the Eastern Townships butter is decidedly ahead of our best. I obtained some butter from special dairies from this neighbourhood and put it on the market in England on its own merits. It brought an exceptionally high price, and buyers wanted more of the same mark.

“We brand our best butter, ‘Choice Dairy Butter, A. M., Perth, Ontario, Canada.’ ‘A. M.’ has been our old mark.”

The firm of which Mr. Meighan is a member were receiving butter from farmers when the Commissioners visited Perth and inspected their establishment. Every tub was opened, carefully tested by an expert, graded, and price paid according to quality. By this method, and a firm resolution to overlook no defects, the reputation of the brand is sustained, and butter from this house can, as in Mr. Broder’s case, be sold by cable at any time. To assail the character of a farmer’s wife’s butter requires no doubt great moral courage, but it is none the less certain that want of care or intelligence in the dairy is the primary cause of so much Canadian butter being of indifferent quality. That this is the case is plain enough from the evidence already quoted. The question presents itself, How is it that, in some countries, where butter is made in farm dairies and the creamery is still unknown, the butter is so excellent and in others so variable? A lecture delivered some time since in Dublin by Canon Bagot, and reported in the *Irish Farmer* of June 17th, 1880, throws much light on this point, and shows that in Ireland, a country whose butter is supposed to rank very high indeed, some of the same difficulties are met with that are experienced here, while in Denmark and Sweden the highest quality is secured. Canon Bagot gives the listeners to his discourse just about the same advice as to butter-dairy cows that Mr. Malcolm gives to the owners of cheese-dairy cattle. He said:—

“He wished to point out to them that it was not the cow which produced the

milk—it was the food which she got produced it. The cow was exactly like a steam-engine. If he got corn to thresh with a machine, he could not do so without water and coal, but when he was supplied with these he could go to work. The cow was a regular machine for providing milk, and it is of the food which you give her that the milk is produced. You may have a bad steam-engine as well as a good steam-engine—one which would require a great deal more coal than the other; and so it was with the cow, some of them will take a great deal more food to produce milk than others.”

He went on to suggest the use of the Shorthorn to secure the dairyman against loss in the event of his having to dispose of his cows, and mentions, as in his opinion, the best breed, a cross between the Shorthorn and the Dutch or Holstein breed. As to winter feed, he mentioned that, in Denmark, the source of the best butter, the great aim of the dairymen was to supply butter to the London market in winter, when butter is dearest, and they can get one shilling and eightpence (40 cents) a pound for it. To accomplish this they feed their cows liberally in the winter months on clover hay, bruised cake, and rape cake, the high prices obtained for the butter making such feeding profitable.

Then, as to dairy management, the Canon went on to say:—

“As regarded churning, there were two crying faults among the small farmers. Being in connection with a butter company, a great deal of it passed through his hands to the London market. The faults were, keeping the cream too long without churning, which gives an unpleasant ‘lack’ to the butter, and over-churning. With regard to letting the cream rest too long, it would be far better to make better quality by churning two or three times a week than to wait until the churn would be full and make inferior quality. The cream, when left to rest too long, actually becomes decomposed like bad meat, and gives a nasty taste to the butter. The other fault was over-churning. He knew that it would be the most difficult thing in the world to get the dairymaids out of that practice. The very moment the butter is formed into little grains like shot—what a dairymaid would call cracked to—they should stop churning that very instant. If they do not, they are actually injuring the butter they have made; they are destroying the quality of it, and they are putting into it the very article that they are trying to get rid of.”

“In Denmark,” he went on to say, “they will not churn anything but perfectly sweet cream, and they lay great stress upon that, as being the means of enabling them to obtain such high prices for their butter. He asked two or three persons in Kerry as to how long the cream was left in the milk, and he was told about thirty-six hours. He thought they ought to change a good deal with the weather; but he might fairly say, in making superfine butter, they should have the cream separated from the milk before it got sour. In the north of France they do not mix the cream; they keep it quite separate until half-an-hour before churning.”

Then the Canon mentioned the fact alluded to by Mr. Inglis, that very few dairymaids use the thermometer to determine the temperature of the cream, and told how he had overcome the prejudices of his own and other dairymaids in regard to that useful instrument. He said:—

“They might ask him what was the thermometer for. Well, it was not dear, it was only eightpence. He called it a labour-saving machine. It shows you the temperature of the cream. When the thermometer stands at 50 degrees it will take an hour and a half to churn, if it stands at 60 it takes less, and if it

stands at 78 you will churn in 50 minutes, because the higher the temperature the easier the globules were broken. He thought the proper temperature in churning was from 57 to 60 degrees. He procured a thermometer for himself and gave it to his dairymaid, but she thought it was a new fangled notion of the master's and did not use it. Last November his wife came to him and told him that it took the women two and a half hours to churn. He told them to use the thermometer, and the result was that, by putting the cream in a vessel into warm water and raising it to its proper temperature, the churning was done in half an hour, and whenever he went to Dublin afterwards he got a commission to buy a thermometer, as his servant told the farmers round about of it."

Cleanliness and Honesty.

The worthy Canon also exhorted his hearers to honesty as well as cleanliness and other virtues. Canadian butter makers need not despair if one fact he mentioned be typical of a system of equivocal practices with the Irish product. He said they should all try and make the best article and get the best prices for it. He also spoke of the injury caused to the sale of butter by putting too much water in it, and referred to a case which came under his observation where a firkin of Irish butter sent to the London market, weighing 69 pounds, contained 38½ lbs. of water. He thought one of the great faults in the Cork butter market was that their tasters passed the firkins with water in them in the same class as those out of which the water was taken.

Education of Dairymaids.

But quite as interesting was the lecturer's reference to experiences he gained in Northern Europe during a visit to that region. He had called attention to the far higher prices obtained for Danish than for Irish butter, the former commanding as much as 23 per cent. more money in the London market than the latter. He then went on to point out how so much excellence was attained by the Danish and Swedish dairies. He said:—

"In the year 1864 and 1865 the Danish people took up the question of dairy education, and they got the Government of the day to establish schools for the education of dairymaids. They commenced this in '64 and '65, and see what has been the result that has been attained in 15 years. The effect of this education is beginning to tell; their butter has risen in price, and, by competition, it is over the Cork butter 2½d. per pound. He might, therefore, argue from that, that their success was owing a good deal to the education of their dairymaids.

"In Sweden the dairymaids were sent to a college to be educated in dairy management for six months. At the expiration of that time they got certificates which fully qualified them to act as dairymaids, and they were snatched up by gentlemen who had large dairies. These women, holding certificates, were entitled to teach other dairymaids, and for that instruction they received fees, which amounted to a first-rate salary. By serving a regular course, under a certified teacher, these women, after spending two months at the college, were themselves qualified to teach. The result of this teaching was that, in those countries, they

made their butter of one uniform quality. Their instructions were defined as to the quality of the salt and colouring to be used in the butter, and the food to be given to cattle. In that way the quality of their butter was uniform, and that was what was beating Irish butter out of the London market."

Finally he drew just such a picture of the contrast between Irish and Danish butter as the merchant visited by Mr. Gibson drew of the difference between Canadian and his Western State consignments. All this shows that, in the best butter-producing countries of Europe, care, skill, and attention to every detail tending to ensure the production of a perfect article are at the bottom of their success. And it is this, which in a measure, although not in the same degree, has given Eastern Townships butter its very high place in the Canadian export trade.

Creameries.

But, while a very great deal may be done by the private dairy farmers to improve Canadian butter, it is to the creamery we must look for the grand improvement in butter that was, not so long since, effected in cheese. It would hardly be to Mr. Broder's personal interest to favour a change from private dairying to the creamery system, but he says :—

"I should prefer that butter in our section should be made in creameries so far as trade is generally affected. It would be more beneficial to the country."

Mr. Meighan, too, admits creamery butter brings a higher price by 3 or 4 cents over the finest dairy butter.

Mr. Inglis, who started the Teeswater factory, thus details his experience :—

"The production from the creamery at Teeswater was not large the first year. We got the promise of 180 cows, but, after we got started they dwindled down to 120, so that we did not pay the expenses in the first year. In the second year we got up to 180 or 200 cows; in the third year we advanced to 280 cows, and after that we got up to over 700 cows. The number always increased up to the time of my leaving, and that creamery is still being carried on. Last season it was very unsuccessful, owing to the low price of butter. We have obtained for our butter from 90 to 120 shillings per 112 pounds, and in the second year after we started the creamery we sold our butter at the creamery for 25 cents a pound, while the other butter was selling at 17 cents.

"We had an agent in England. I believe we commanded the full value of the butter there, especially as there was some difficulty in persuading the people that Canada could produce good butter. In 1878 we got 102 shillings, while Danish was selling an 116, and Irish at from 104 to 106. In the second shipment we exceeded the Irish butter by two shillings, and came within four shillings of the Danish. Our agent was at Leith, Scotland, and we were very fortunate in securing him. He came to our factory and examined it—he had seen the Danish and other butters—and he acknowledged then that our butter was equal to anything he had seen in his life. I gave him ten tubs at 25 cents, and the next fall he came back and took it all at 25 cents. He had been buying butter and losing heavily, and he wrote to us saying that ours was the only butter that he did not lose money on. That butter, I think, is superior to the first-class butter in England."

When the Commissioners visited Teeswater and examined Mr. Hettle, the present manager of the creamery, he was holding his season's produce against an offer of 24 cents a pound, expecting to realize a higher figure. Both Mr. Hettle and Mr. Inglis fix eight cents as the value in the market of creamery butter over the dairy butter of the district, the ordinary western farm dairy article. Mr. Inglis points out the enormous advantages of the creamery system to the farmer in the matter of profit alone. He says:—

“In the township of Culross I don't think there would be any difficulty in obtaining 2,000 cows; and the difference in the profits between making their own butter and making it by the creamery system would be at least \$15,000. 2,000 cows will produce, we will say 8,100,000 pounds of milk. Dividing that by 25 we find the number of pounds of butter produced, 324,000, which at 14 cents a pound, would yield \$45,360. Butter made in the factory would easily bring 20 cents a pound, or for the same quantity \$64,800. That would be a difference of \$19,440 in the township, and that is only allowing 6 cents of a difference in the price; and assuming that the same quantity of milk would be necessary in both cases, 20 cents is a low average of the price of butter made in the factory, and 14 cents is a high average of the price of butter collected from the farmers. Many of the farmers who were slow to go into this factory at first have since said that they made money out of it.”

That the farmers of that district are quickly finding out the benefits to be derived from this system is evident from Mr. Hettle's evidence. He says:—

“I have been engaged in butter-making six, and in cheese-making three years. The Teeswater factory adopts the plan of purchasing the milk from the farmers and making butter and skim cheese. We collect the milk from the farms. We pay 7 cents per gallon for the months of May and June, and 6 cents for July and August, and 7 cents for the balance of the season. We run from about the 10th May to the 10th November. We started the skim cheese making in 1878. Previously we ran butter alone and fed the skim milk to the hogs. We have found our present plan more economical and profitable in ordinary seasons. From 35 lbs. of milk we average 1 lb. of butter and 2½ lbs. of cheese. The gallon of milk weighs 10 lbs. The farmers generally are taking advantage of the system. Last year we ran up to 22,000 lbs. of milk per day in the height of the season, representing nearly 1,000 cows. Farmers are feeding their cows better and going in more heartily for dairying. I have advised the use of oil cake as a feed, but not with much success. I circulated a number of the reports of the Dairymen's Convention, held in London in February last, among the farmers. Some four other butter factories have been established within twenty miles of this place, probably as the result of our experiment.”

For three months' milk the factory, at the time of the Commissioners' visit, had already paid out \$7,931. Mr. Inglis states that, under his management, in the fall, 22 lbs. of milk would make 1 lb. of butter, although 1 lb. to 27 lbs. was the average of the season.

But, even in the comparatively newly-established creamery system there has been introduced a radical improvement. It is known as the Fairlamb process, and is described by Mr. Inglis as follows:—

“If I were starting a creamery now, I would not follow the same plan that I followed then. The principle is a false one, and the cost is enormous. I would

adopt what is called the Fairlamb process—bring the cream to the factory and leave the milk at home.

“There is a factory conducted on this plan in Iowa in which a thousand pounds of butter a day are made, with just four men employed in the establishment. Under our system eight men, at least, would be required to do the same work. To make a thousand pounds of butter, 25,000 pounds of milk would be required, and at least twelve teams and twelve waggons would be necessary to draw this milk to the factory. At the factory it would be necessary to have vats that would hold about 600 gallons. You would have to fill these with the milk, let it cool, and allow it to stand for about 36 hours. Twelve or sixteen vats would be required, costing \$80 each, as it would be necessary to have vats enough to receive the new milk while what was received before was cooling. Then you would have to skim all this milk, and go through all this extra labour, whereas under the other system you have simply to receive the cream in the factory, you do not need any vats, and as soon as the cream comes in, you turn it into butter.

“In the Fairlamb system the farmers do not require as large cans as they do for cheese. The Fairlamb can is $17\frac{1}{2}$ inches high, 12 inches in diameter at the top, and $10\frac{1}{2}$ at the bottom, and is provided with a tube in the centre for cooling the milk. The cover is of tin, having a rubber band placed around it, so that when the can is covered it is air-tight. The can is provided with a glass gauge, inserted in its side, for measuring the depth of cream. It holds $7\frac{1}{2}$ gallons of milk. The can stands on three knobs about two inches high, and the tube running up the centre is four inches in diameter, and comes within three inches of the top of the can.

“In order to cool the milk, the can is placed in a square box filled with water, and the water revolves about the can, so that the cooling process goes on constantly. After it stands twelve hours, there is a complete separation of the milk and the cream; the cream is all at the top, and the milk is pure and sweet, and the gauge at the side of the can shows the quantity of cream in it. The cream is then gathered and taken to the factory, where it is paid for at so much per inch, according to the price of butter.”

The great advantages of this system are:—

1. Economy of management—the bulk to be handled being diminished to one-sixth.
2. The absence of opportunities for adulteration, and consequent uniformity of quality in the material.
3. The facility for drawing or collecting small quantities instead of large quantities, over a wide area.
4. The less liability of cream to suffer by being kept in motion, than milk.
5. The saving of the skimmed milk for the feeding of pigs or young stock.
6. The smaller cost of factory and appliances.

The system is rapidly becoming popular in the States, particularly in Iowa and Illinois, and, it may safely be predicted, will become universal. It appears to be admirably adapted to those districts where roads are rough, population somewhat sparse, and communication more or less difficult.

Economy of Creamery Butter-Making.

What the creamery system, if adopted in Canada, might do for the country, may be estimated by a comparison of the prices obtained for the butter at present exported with those obtainable by creamery brands. The declared value of the butter, the produce of Canada, exported in 1879-80, was \$3,058,069, making the average value per pound 16½ cents, which is probably a tolerably correct approximation to the actual prices received. Now, it may safely be concluded that, if that butter had been represented by the same quantity of creamery brands, it would have brought, even at the depressed rate of prices, at least 22 to 24 cents per pound. If an increased value of 6 cents only had been obtained, it would have put just \$1,112,121 into the Canadian farmers' pockets. But that would represent only partially the actual gain secured. The economy of the manufacture by the factory method—the production of a larger quantity of butter from a given quantity of milk—would be in itself an enormous profit, and the increased demand for the best instead of the inferior article would soon double or treble the value to Canada, of the export butter trade.

A few suggestions made by the witnesses as to the operations of a factory may be useful. As to the selection of suitable sites for creameries, Mr. Inglis says:—

“In selecting districts for the establishment of creameries, I would be guided to a large extent by the nature of the streams. Water gives both body and flavour to butter, and good butter cannot be obtained if the cows are allowed to drink out of sluggish streams. In order to get good butter, we must have fresh running water for the cattle to drink, and that is the kind of water to be had in Huron and Bruce—remarkably fine water.

“Good well-water is good for butter-making. Still, the cows would not do so well on it as where they have free access to a running creek. They will not produce the same quantity of milk; we find proof of that on farms fed with water from pumps. This has reference to ordinary cows.”

Mr. Inglis fully corroborates what has been said elsewhere in connection with feeding cattle. As to the necessity for a more scientific method of cultivating pastures, he says:—

“I should like further to remark that it is the food which sustains the cow that also produces the milk, and the milk, to a great extent, retains the odours of the food. Hence the necessity of studying the pastures. The farmers should study more fully the subject of pasturage, also the nature of grasses; and seed down more heavily with all the long grasses that will grow, as some mature faster than others, and, as one fades away, another will take its place. Hay is generally cut too ripe, as after it is dried it becomes woody, and there is very little nutriment left in it. If cut green and well saved, the difference in its milk-giving properties is enormous. Butter made from ripe hay is always white, and lacks the rich aroma that makes it a luxury.”

He adds on the last point:

“Butter can be produced with a good colour in the winter season if farmers will feed their cattle on hay which has been cut five or six days before being ripe. The natural juices of the hay are better retained in the green state, I suppose,

than in the ripened state. I would not recommend feeding turnips or potatoes to milking cows whose milk is used for butter-making. I think milking should be done with the teats dry. Tin pails are much superior to wooden pails for milking."

Mr. Inglis does not recommend imparting any other than a natural colour to butter. He says:—

"I do not recommend colouring butter, unless it is made of hay; I never coloured a pound of butter, and do not believe in it."

Temperature of Milk.

The question of the temperature of the milk is thus alluded to:—

"The cream rises with the change of temperature. If the milk gets chilled, as it is apt to in the fall of the year and winter, the cream will not rise, and it will become bitter. I would recommend heating the milk to about one hundred and twenty degrees. The cream rises because it has a less specific gravity than the milk; and you can make it rise in two ways: you can, by using ice, reduce the temperature to about forty-five degrees, the cold will act more on the milk than on the fatty matters, and the consequence is that the milk goes down and the cream comes up; or you can heat the milk up to one hundred and twenty degrees, and although the heat acts more quickly on the watery portion of the milk than on the fatty portion, as soon as the cooling process commences, the watery part of the milk loses the heat more quickly and falls to the bottom, while the cream rises to the top. I think that is the only remedy to prevent the bitterness of the cream in winter. The heating of the milk expels the animal odours from it. I would heat it as soon as it comes in."

Management of Milk and Churning.

The processes of skimming and churning are also referred to by Mr. Inglis. He says:—

"The real standard test for the proper time of skimming milk is to take the finger and bring it across the cream. If, in doing so, the cream lies apart and you can see the milk, it is time to skim.

"The churn is of great importance, and there is a great deal of milk spoiled in the churning. The great bulk of the butter made in this country is whipped to death in the churn. For farmers, the dash churn is the best. The dash should be concave in the bottom, so that it makes a vacuum when the dash comes down, thus striking the milk more by concussion. There should be no holes in the dash, as they tear through the milk and break the grain. The barrel churn, with a stationary dash, is the best for general purposes. The Blanchard is also a very good churn.

"Patent churns, which work by friction, bring the butter rapidly, but it spoils the quality by whipping the cream. I have not seen the pendulum churn. The whole difference between a good and a bad churn is in getting the milk by concussion instead of friction. A churn suspended by the two opposite corners ought to be a good one.

"If cream is allowed to stand too long before churning, it becomes very thick. There is a certain amount of curd forms in churning, which can be detected in little white specks all through the butter, and there is no means of removing it. These

specks are formed by the milk souring, and the cream getting too thick. It could be remedied slightly by putting a little milk in the cream and thinning it. I have tried both sweet and sour cream, and am confident that you can make the sweetest butter from sweet cream. Sweet-cream butter, I think, will keep as well with the ordinary quantity of salt as dairy butter. But that is a point very much in dispute.

"I fail to see why butter which is churned from sweet cream should not keep. To show the advantages of what I call ripening the cream, I have taken cream that was slightly acid, and after churning, took one hundred and twenty-three pounds of butter out of the churn; I then told the person who was churning to continue churning, and I took thirteen pounds out an hour afterwards. From the first cream that rises in about twelve hours I would make the best butter, almost gilt-edged. I account for that by the fact that the larger globules rise first, and the greatest aroma is in them."

The proper manipulation of the butter is, in Mr. Inglis' opinion, hardly second in importance to the treatment of the milk or cream. He says:—

"I would not work butter more than once, and not that if possible. In churning, as soon as the butter granules form, I would advise drawing off a slight portion of the buttermilk from the bottom of the churn, and then adding a few pails of cold water, and after a few more revolutions of the churn, the butter will all be formed into complete granules. I would then remove it, wash it, put it on the board, and give it a slight touch, so that if there is any buttermilk on it, it will come off. Then mix in half an ounce of salt per pound; lay it aside for twelve hours; then take it, and work it, and put it into the tub. Over-working the butter injures the grain and makes it greasy, so that the taste is gone."

A Cream Separator.

In this connection, a new invention used in Sweden, and referred to by Canon Bagot, in the course of his address already quoted, may be mentioned. He says:—

"There was one instrument which he thought would cause an entire change in the dairies of that country, and that was De Laval's separator. He saw one in Sweden dealing effectually with the milk of 4,000 cows. The milk was delivered by rail and passed into the machine, which was managed by six persons. As fast as the milk passed into the machine the cream came out one spout and the milk from another. The churns were always working, and within four hours after the milk left the cow's udder it was on its way to London in butter. It was a machine which, when it came into general use, would almost entirely dispense with the use of dairies. The Roman Catholic Bishop had got this separator, which is worked by a two-horse engine, and in a report which he made he spoke in the highest terms of it. That was the only one in Ireland, with the exception of the one the associated dairies of Dungarven had. There were great doubts as to whether the cream was entirely separated from the milk by this process, because, when the milk was tasted after the separator, it was very good. The milk was submitted to an analyst for investigation, and he found that milk skimmed from cream in the ordinary manner contained fully $3\frac{1}{2}$ per cent. of butter fat, whereas skimmed milk obtained through the separator only contained $\frac{1}{4}$ per cent."

Two of these separators were exhibited at the International Dairy Fair, at

New York, in 1879, and one or two are in use in the States. How far they may be adapted for general use the Commissioners have no means of knowing.

Packing Butter.

But the best of butter may be disgraced, no matter how carefully it is manufactured, by slovenly packing. The evils of the ordinary country storekeepers' trade in butter have been already mentioned. They are at the bottom of the mischief in a very large proportion of cases. But the dairy packing is often not all it ought to be. What Mr. Broder says as to the use of inferior packages has been already quoted. He goes on to suggest a remedy:—

“Last year we took pains to have the people pack their butter in uniform packages, all small. We had been using in that section of country a firkin holding about 110 lbs., but it was not satisfactory in England, because the grocers could not find customers who would take the whole package, and it was very inconvenient to handle on the counter. If they had a tub holding 50 or 60 pounds, they could turn it up on the counter, lift it off, and the butter would be clean. It has never occurred to me to supply my customers with tubs, though I have done so occasionally early in the spring.”

Mr. Meighan buys in 50-lb., 80-lb., and 100-lb. packages, but prefers the 50-lb. tub as the one suiting the Glasgow and some other old country markets. The 56-lb. tub (the English half hundred weight), is now in use at the Teeswater creamery. Care, too, in packing is especially enjoined. Mr. Broder says on this point:—

“People do not pay sufficient attention to preparing their packages for packing butter. A great many of our farmers will take a package to the pump and fill it full of water, and set it in the sun, so that it is soaked in the inside and scorched on the outside. The result is that they are twisted into all shapes, and unfitted for holding brine, and they also become discoloured. Too much cannot be said about exercising care with packages. I do not believe in soaking them much in water.

“*They should be scalded out thoroughly with warm water and then rinsed with spring water to cool them.* Adding a little brine is no injury, and perhaps may be a benefit, as a little salt in the water seems to take the taste of the wood away. There is nothing that cleanses them better than buttermilk, but we dare not recommend it, because some of the people would not thoroughly cleanse them afterwards. The tubs should be about 56 pounds.’

Apropos of packages, it may here be mentioned, that a very large trade in butter in metal packages, hermetically sealed, is done by Sweden with the West Indies. Mr. Inglis says respecting this trade:—

“The best butter which is made in Sweden, and exported to the West Indies, sells for 50 cents, and it is put in tin packages. In the United States they generally sack the butter tubs before shipping; it not only keeps the butter cool, but when it arrives the packages are clean and more attractive.”

A handsome, japanned tin package, with air-tight lid, was also exhibited to the Commissioners when in session, by Mr. Joseph Blakeley, of Toronto, and

favourably regarded by Mr. Inglis, if it, or one on the same principle, could be supplied at a moderate cost. Mr. Inglis' views, generally, on butter-packing, are expressed as follows:—

“When making butter I would recommend excluding the air, if possible. I think the 56-lb. tub is the best. If you have a smaller tub you are apt to have a higher tare, which is a considerable item. If you have a 25-lb. tub you will pay 20 cents for it at least, and you will have 6 lbs. of tare; whereas, if you have a 56-lb. tub you will have to pay only 33 cents for it, and the tare will be only 8 lbs., although you have double the quantity of butter. The Dutch butter is generally sent in about 100-lb. firkins. I think the butter would be more exposed in 25-lb. tubs than in 56-lb. tubs. The tubs that come into the Chicago market are all sorts and sizes, from a 5-lb. one up to 70 or 80 lbs.; the consequence is that any tub that runs from 5 lbs. up to 35 or 40 generally sells at $1\frac{1}{2}$ cent a pound less than a tub weighing 50 or 56 lbs.”

Mr. Broder remarks on this point:—

“Some have gone to the trouble of putting their tubs in coarse sacks, and wrote over to see if this would be an advantage, but were told it arrived in such good condition that it would be a useless expense.

“It is a very unwise thing to have many names on the tubs, and the name of the cooper should never appear on them. In England the people get it into their heads that all the different names are those of the people who make the butter. We plane everything off our tubs but the weight. If our butter was good average butter it would be well to have the words “Dominion of Canada” printed on the packages.

“There was a time when our butter found its way across the line and they put our bad butter along with their own and called it all Canadian, and they took our good butter and, putting it with theirs, branded it American.”

On the whole a 50-lb. package neatly made, tasteful in appearance, and with a clear, intelligible distinctive brand, that all the world may identify it, is probably the best for ordinary purposes.

Use of Salt.

The too lavish use of salt is also to be guarded against. At the Teeswater factory, Mr. Hettle says:—“About three-fourths of an ounce of salt is used for every pound of butter stored for future shipment, but, not over half an ounce when the butter is shipped every month. . . . We brine the butter frequently, and keep it moist when in store.”

Mr. Stedman, of Drummond (Lanark), uses about one ounce to a pound—a little more or less in warm or cold weather.

Mr. Inglis says regarding salting the butter:—

“The Americans use one ounce of Higgins' salt to one pound of butter, but it is too much, as mild-salted butter will bring 5 to 10 shillings more per 112 lbs. in the English market. I use the Canadian salt, which I am confident is equal to any English salt in the manufacture of butter.

“In placing butter in a package for shipment, I would put in the butter within half an inch of the top, and would fill up the remaining space with salt, wetting

it sufficiently to make it pasty. That makes a solid, firm keg, and excludes the air, and the salt that is in the butter makes its own brine. I do not think it advisable to put brine in the keg."

Care in Shipment.

Care in shipment, and the securing of a cool and cleanly part of the ship for the storage of butter, is a matter to be arranged between the shippers and the steamship companies. It is probable that those who ship good butter will think it worth while to pay special attention to this particular, and that, where this has not been done it has been owing to the shipper having little respect for, or expectation from his goods.

Small Creameries.

As it is desired in this Report to notice every phase of the dairying interest, it may not be out of place, before bringing this chapter to a close, to refer to the small portable creameries in use in some places. One of these is mentioned by Mr. Joseph Yuill, in his evidence, given at Almonte. He says:—

"We have a small private creamery and make our own butter. . . . Some of the stock are young, but 200 lbs. of butter would be a fair season's average to a cow. . . .

"Our creamery is calculated for 15 cows. It is known as Evans' creamery, and consists of five cans costing \$25. They are about two feet high, of seven or eight inches in diameter, and in two parts connected by a narrow neck with a stopper. The lower portion will hold about fifteen quarts and the upper five quarts. The cream is suffered to fill the upper part of the vessel. The stopper is inserted, and the upper part of the vessel can then be easily removed.

"The milk vessels are immersed in cold spring or iced water for twelve hours until the cream has risen. The cream is then put into another vessel to ripen for about thirty-six hours, and then churned by a dog power in an old-fashioned churn."

At Mr. Gile's establishment, mentioned already in connection with cheese, but where he also makes butter, the plan pursued is, as described by Mr. Gile, as follows:—

"Our system is: First set the milk in tin pails, which hold about 35 pounds, in a water pool. This pool is constructed of two-inch pine plank, water-tight, 6x12 feet, 2 feet high, with a lid on hinges to shut down when required. Into this a stream of cold water is pumped, and in hot weather ice is put in to make it cooler. The water comes up to about six inches of the top of the pail. The pail is about eight inches in diameter, and twenty inches deep. It takes from 24 to 36 hours for the cream to rise.

"Then the cream is skimmed and churned in an upright churn. The churn is capable of churning 50 pounds of butter, and three of them are working at one time, with one shaft stroke, 18 inches to each churn. The motive power is steam. The cream is heated to 62° before churning; it takes about 40 minutes to perform the work. These churns being open at the top, the maker can easily tell when the butter is coming. Before it begins to gather we put in some cold water. This

gathers and hardens the butter. We partially coloured the butter this season by putting a little annato into the cream before churning.

"The butter is then taken out of the churn and put into the worker and washed. Ice is then put on to cool it before salting. It is then left for three or four hours, then salted with one ounce of salt to the pound of butter. The salt used is 'Higgins' Brand.' Then it is packed into 50-lb. tubs, a cloth put on the top and neatly covered with salt. Butter thus made has commanded the highest price in the market this season."

The Commissioners find, in these minor enterprises; in the active efforts of such men as they have had before them, engaged in the butter trade, to impress the necessity for improvement on the minds of the dairy-farming community; and, finally, in the anticipated establishment of creameries in every butter-making district, the promise of a greatly enhanced foreign demand for Canadian butter, of a lucrative trade in that product, and of large and ever-increasing benefits therefrom to the agriculture of the Province.

CHAPTER X.

HORSE BREEDING.

In that portion of their inquiry to which they have now to refer, the Commissioners will endeavour to keep in view the double object under which the question of Horse-breeding presents itself to the Canadian farmer. He has to ask himself—first, what is the description of horse needed for his own ordinary purposes; and, secondly, what class of horses will find the best market and command the best prices if he raises a surplus stock.

That Ontario is peculiarly well adapted for raising good horses of every description is a fact that no one will dispute. The climate is bracing and invigorating, the soil produces in unlimited quantities the food that gives stamina and vigour to the constitution of the horse, the hand and eye of the owner himself are almost always upon the young animal in its early life. Mr. Wiser remarks on this point:—

“In regard to producing mature, average-priced horses, I think our soil and climate excel. Our seasons in Ontario are just what is required to mature and educate a good roadster. After weaning, the first winter of his coltage brings him all the time for his feed and care in contact with man, his future master. These surroundings tend to his docility and tameness. The next six months of summer give him the very best grazing and pasture, with a temperate atmosphere and plenty of palatable unstenched water for drink. Alternating between his freedom in summer and his contact with his keeper in winter, the first three years of his life, if gently handled, make him docile, tractable, and free from vice. Our winter seasons of snow and ice make it a pleasure to break him to harness and labour, and give him his first lessons with but little fatigue and exertion to himself. My life-long experience has been that horses matured and brought up as is our custom in Ontario, make more docile, less vicious, hardier, tougher, more endurable, and more valuable animals than those reared in a southern climate.”

Then comes the question, Have we in Canada the material out of which good horses can be got for the varied purposes of the road, the farm, the hunting-field, or the race-course? This will be best answered by reference to the evidence itself. That evidence shows, not only that there are a very large number of imported horses in Canada used in the improvement of the stock, but that there are Canadian families of horses of distinguished merit also available for this purpose. It shows too, that, if there is at the present time a dearth of good marketable horses in Canada it is largely due to the fact that the United States—a twenty per cent.

duty notwithstanding—afford an unlimited market for every good horse the Ontario farmer cares to sell, and for some not very good ones besides.

Foreign Demand.

Mr. George Tumlin, an extensive horse dealer of Toronto, speaking on this point, says :—

“ My business is to buy draught and general purpose horses—mostly the former. For the class of horses in which I deal the American market stands higher than others. The American draught horses grow too rapidly on the prairies, and, feeding on corn, are too soft ; while our Canadian horses grow more slowly, and are better footed and better limbed.

“ The Americans tried to do the breeding themselves, they brought those soft animals from the prairies, but they could not get along at all, they found they had to go back to the Canadian horses. The feet of the latter are better,—they are strong-boned, and they do their work better ; besides, a great many of the western horses die the first year they are brought to the east ; they do not become acclimatized so easily as ours.”

Mr. Wiser's evidence on this point is as follows :—

“ I could myself sell ten times as many draught horses as I do, if we had them suitable for the American market. For the general run of our horses the United States is the best market, and it takes from us the class of horses that would not be suitable for the English market at all. Our best draught horses would sell well in England, but not at much higher prices than in the United States.

“ There is a demand in the United States for all that we can raise, and more. The country is full of buyers who are not able to get such horses as they want. If we had the right kind of roadsters, we could sell all we could produce.

“ Our best roadsters go to the American market. Canadians sell a large number in Montreal for that market.”

Mr. George Houghton, of Seaforth, an old and experienced dealer, says :—

“ Canadian horses are preferred in New York and Boston to horses from the Western States, and command from \$25 to \$50 a head more. For ordinary horses I have been paying from \$90 to \$100, and for good Clyde horses from \$125 to \$200. I consider Clyde horses more profitable for farmers to raise than any others, as they are able to work when they are two years or two years and a-half old. The reason Canadian horses are preferred to Western American horses is that they are not fed so high and will wear better. Western horses are fattened on corn like so many pigs, and it injures them. Canadian horses will thrive, while western horses go backward.”

Here then is clear and positive proof in the most tangible form, of the estimation in which a Canadian-bred horse is held, and the reasons for his reputation.

The Horses of the Province.

The next point to consider is the supply of horses of a stamp for providing the best and most useful or marketable article. To obtain at a glance the position of the business of horse-breeding in Ontario, the Commissioners

invited the attendance of Mr. W. H. Williams, a gentleman well known as the sporting editor of the *Toronto Globe*, whose duties necessarily bring him into communication with all the principal breeders in the Province.

From his statement it is evident that, neither of thoroughbreds for stud purposes, nor of Clydesdales,—either imported or Canadian bred,—is there any lack.

He calls attention to the fact that, in Mr. Wiser's establishment, at Prescott, are the headquarters of the great Hambletonian trotting family, of which more will be said presently, with a stud representative of the Royal George strain, while Royal Georges and Clear Grits are doing excellent service in Western Ontario. Then, too, the St. Lawrences, Pilots, Tippoos, Pacers and others are all found scattered up and down in districts where some one or more members of one or other family have happened to be stationed at a more or less remote period.

So that, in all the Province, are the descendants of thoroughbred or pure-bred sires, some crossed and recrossed it may be to the second or third remove, but still retaining not a little of their ancestral type. It is from mares carefully and judiciously selected from these that the material on the dam side has largely to be depended upon for the future improvement and development of horse-breeding in Ontario.

Selection for Breeding.

At the commencement of the chapter on General Farming the Commissioners endeavoured in as few words as possible, to explain the principles on which breeding, to be successful, must be conducted, and which, as already mentioned, are most ably stated at length in the evidence relating to Horse Breeding in Appendix K. Now, if, in the case of an animal that is bred merely for slaughtering, it be necessary to follow rigidly the theory and principles on which the breeder should proceed, how much more necessary is it to do so in the case of a creature of requirements so varied as those demanded from the horse—form, action, speed, endurance, intelligence. If it be needful to keep the precise object it is desired to attain well in view when breeding a steer or heifer for the shambles, how all-important is a clear, distinct and well-defined purpose, when the desire is to produce a first-class specimen of a far nobler animal? But, while, by the aid partly of favourable circumstances, Ontario farmers have bred a great many good horses of their kind, and while, as already seen, they can do well by their horses, so far as they go, it is none the less true that, in a great many cases, the advent of a really good horse is more a matter of chance than of calculation. The first thing to be ascertained by the farmer is, what blood the mare he proposes to breed from has got in her. If she is bred from the Clyde, and is cold-blooded altogether, and is big enough to be properly bred to a Clyde horse, then her owner had better keep her for raising draught horses of as heavy a type as she will give. But if, on the other hand, she has any thoroughbred running blood, then, with the

equally well bred Hambletonian, the Royal George, or the Clear Grit, she will have more or less affinity, and may be used to raise colts of a superior class, which will be likely to possess many of the characteristics of the sire. This, of course, presupposes that the mare is free from taint, blemish, or other practical objection to her use in the premises. To employ for breeding, a mare that is likely to transmit defects inherited or otherwise acquired, is not to be counterbalanced by the quality of the horse she may be covered by.

That none but a pure-bred horse of any family should be employed for breeding purposes is a maxim it should not be necessary to repeat.

There are, however, plenty of grade stallions showy enough at first sight, travelling the country, whose services can be obtained for a very small fee, while a really pure-bred horse must, of necessity, be made to pay his owner by earning a fair consideration for his stud services. Once more, let it be said most distinctly and emphatically, that the farmer who allows his mare to be served by any but a pure-bred stallion of proved and undoubted pedigree, is as foolish as one who buys cheap seed peas infested with the pea-bug, on the chance of getting one-third, or one-half a crop of an inferior article, instead of a full crop of the best. If, after reading the evidence on this point, anybody is content with the services of the most elegantly got up mongrel, he will deserve to be a loser by his folly.

The General-Purpose Horse.

For his own use, the farmer may be assumed to want what is termed a "general-purpose horse." Now, what does a "general-purpose" horse mean? Mr. Williams says, on that point:—

"The animal that is classed at our fairs as a general-purpose horse is a misnomer, being very much too heavy and clumsy. My idea of a general-purpose horse—that is, a horse for a farmer's own use—is that he should be an animal, a pair of which (and many farmers have only one pair) can be driven to market, taken into the woods to haul out cordwood, or sent with the boy for the doctor at a good rate of speed, and this kind of horses is seldom shown as agricultural or general-purpose horses. Those shown at fairs as agricultural or general-purpose horses are mongrel Clydesdales, as a rule, and I think they are the worst class of horses we have."

No one will deny that this is, to a very considerable extent, true. A large proportion of the so-called general-purpose horses, as Mr. Williams says, are "mongrel Clydes," and only got by mongrel Clydes out of mongrel Clydes. Now and then a pure Clyde crosses the track, and a superior horse of the Clyde strain is the result; but the ordinary general-purpose farm horse is, as a rule, simply a horse adapted for farm work, slow-paced, a useful drudge, and nothing more. The term "general-purpose," is, as the witness quoted remarks, a misnomer. Mr. Williams goes on to say:—

"I think the horse that weighs 1,050 or 1,100 pounds is, the year round, quite heavy enough for agricultural purposes and for all ordinary farm work, ex-

cept, perhaps, that on the very heaviest of clay lands. I think, especially in the vicinity of Toronto, the farmers are doing themselves incalculable injury by breeding moderate-sized mares—mares good in their way—to those great big Clydesdales. It is the old story of the mother not affording sufficient nourishment for either the fœtus or the colt after it is foaled, and the result is a thin, flabby, loosely made horse."

Mr. Wiser in suggesting an improved system of breeding in order to obtain a really general purpose horse, says :—

"You would get a horse that would do for ploughing and such work as that, and would be able to go on the road and drive at the rate of twelve or even fourteen miles an hour if the roads were good. They would not only do for farm work but they would always command a ready market at good prices. It would not do for such a purpose to cross Thoroughbreds with the Clyde, as the Clyde is too heavy for road purposes. About six miles an hour is about as fast as you should drive Clydesdales; but if you want to go hastily to church, or to the mill, or to town, you require a horse that would be able to go at least ten or twelve miles an hour. For such a horse I would breed our native mares with some well bred-trotting sire, taking such natives as we can get and improve on them by using their progeny as dams for future breeding.

Dr. McMonagle quotes in his evidence from a high American authority with regard to the horse the farmer wants for general purposes and which is described as "a big bay horse, sixteen hands high, weighing 1,200 lbs. with plenty of bone, symmetrical all over, elegant and stylish, and with a natural trotting gait equal to a mile in three and a half or four minutes." For the every-day purposes of the ordinary Ontario farmer a horse somewhat lighter than the one just described would be the kind most desirable.

Market for Draught Horses.

But there is also the horse market at home and abroad to be taken into consideration. For the American demand, in the first place, for draught horses in the cities, weight, size, and bone, not speed, are needed. Mr. Geo. Cockburn of Baltimore (Northumberland), who raises horses especially for the American market says :—

"We sell most of our horses in Pennsylvania, and they are sent to New York and Philadelphia for draying and other heavy work. The buyers come around for them at all seasons of the year, and if the horses are to be had, they are sent to the Pennsylvania farmers to bring into condition—that is, horses that are in low condition, which the Americans purchase. I would advise the farmers in this country to procure the best Clydesdale mares to breed from, as heavy horses, will, I think, always be in good demand. To raise a colt up to three years would cost about \$100, and it would be worth at that age from \$150 upwards. When I speak of Clydes, I mean horses got by a pure Clyde horse from a common mare."

Mr. Robert Beith, of Darlington (Durham), another breeder from pure-bred Clydesdales, says :—

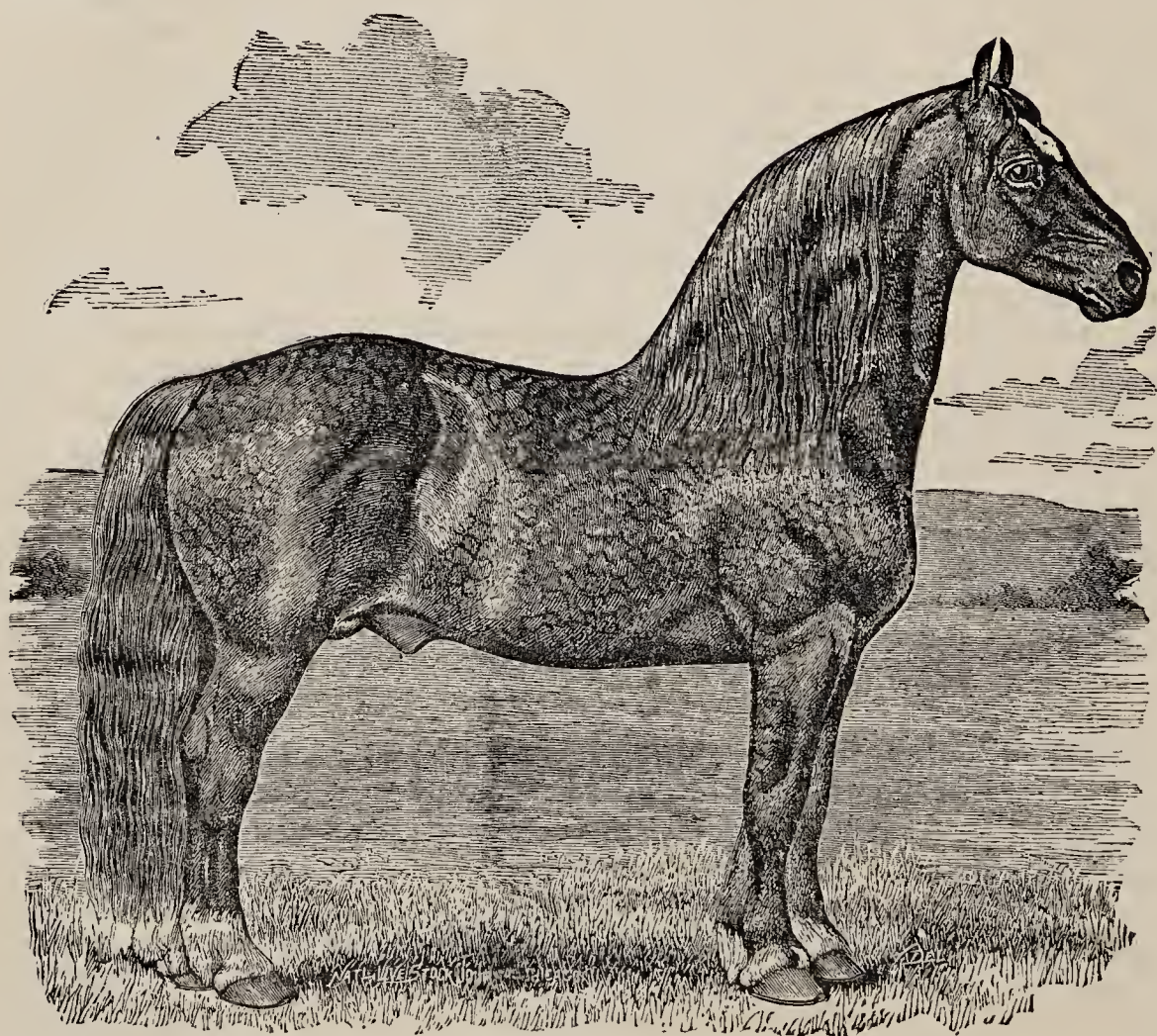
"We breed our own well-bred Canadian mares to the best Clydesdale stallions we can procure, and when the colts reach four years old they can be sold readily

at from \$150 to \$200. These are heavy horses, weighing 1,000 to 1,500 pounds or thereabouts. I find them very useful on the farm, and when I wish to dispose of them I can do so easily.

"I would not call them general purpose horses. They are rather draught horses for the American market. I sell to jobbers or dealers. Good Clyde stallions at three years old are worth about \$1,000, bred from Canadian mares with four crosses in them."

Mr. Wiser says :—

"There are not enough draught horses in Canada to supply the American demand."



CLYDESDALE HORSE.

He goes on to say :—

"Clydesdales are, I think, altogether the best strain to use upon our native mares to improve our draught horses. I should certainly stick very closely to them for that purpose. Of this stock I would strongly advise the use of imported or thoroughbred sires."

Mr. Patteson remarks :—

"The best horse for actual draught that we have, is unquestionably the Clyde, as nearly pure as can be got. By draught horses I understand you mean

such as are suitable for railway lorries, brewers' and distillers' waggons and drays, or fitted for taking about machines."

Mr. G. A. Houghton, of Seaforth, who also looks at the subject from a buyer's point of view, with the supply of the American market as his object, says :—

"Canadian horses are preferred in New York and Boston to horses from the Western States, and command from \$25 to \$50 a head more. For ordinary horses I have been paying from \$90 to \$100, and for good Clyde horses from \$125 to \$200. I consider Clyde horses more profitable for farmers to raise than any others, as they are able to work when they are two years or two years and a half old. The reason Canadian horses are preferred to western American horses is that they are not fed up so high and will wear better. Western horses are fattened on corn like as many pigs, and it injures them. Canadian horses will thrive, while western horses go backwards."

In this connection, however, there is one matter worthy, perhaps, of consideration by the farmers of Ontario. Mr. Tumlin describing the nature of his trade with the States says :—

"I am now buying horses of three, four, and five years old. They are sent to different counties of Pennsylvania among the farmers, each farmer taking so many to feed at so much a day. They feed them thirty or forty days and then they go to New York. I don't know any reason why we should not keep the profit of feeding them among our own farmers, but what I have stated is the practice. These horses are for farm and truck use. The farmers of Pennsylvania will feed them forty days at 30 cents a day, besides keeping everything on the farm. Including the duty, commission, and other expenses, it costs about \$10 a head to take the horses to Pennsylvania. I pay for these horses from \$150 to \$225, the average would be about \$175. These horses must be sold in New York for about \$250 or \$300, by the Pennsylvania feeders. They feed them much heavier there than we do here—they will feed them up from 1,350 to 1,500 lbs."

He says further on :—

"If the farmers here were to fit up their horses on their own farms, instead of our having to send them to the United States farmers for that purpose, we could afford to pay them what we now pay to Americans ; we could perhaps pay \$20 or \$25 more. These men who feed them up on the other side feed them pretty much on soft feed and corn, oats, bran, etc. They have no peas or barley. The bran is more used as a laxative than anything else. Oats are about the best food for them. The gain in grinding the oats is that the horses are able to feed faster. The horses are kept indoors all the time, except when they go out for exercise. Sometimes the horses are worked all the time they are there. There is one man who has over 500 horses feeding for these New York men. These horses are used for truck work of various kinds. The lager beer business gives a great demand for our horses, owing to its having grown to such dimensions. The proprietors of the breweries will have only the very best horses and harness, and the horses are nearly all Canadian. I would prefer seeing the feeding done by our Canadian farmers than by others."

Mr. Houghton's business appears to be very similar to Mr. Tumlin's, and he also mentions the intervention of the worthy Dutchmen between the Ontario

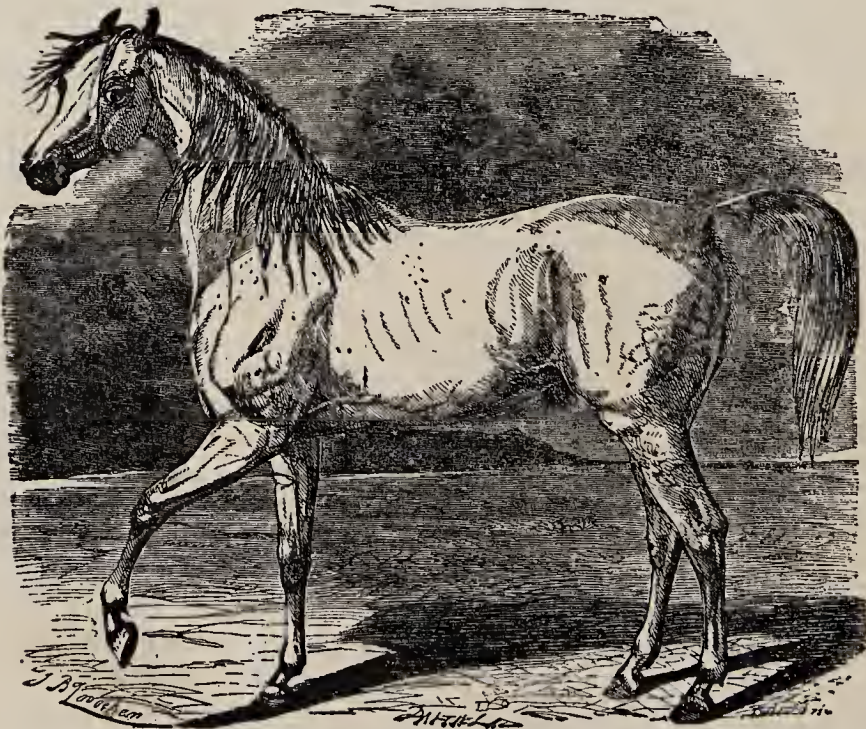
farmer and the New York or Boston final purchaser. Why the Ontario farmer should dispose of his horses in poor condition, when he could make, in a very short time, a considerably enhanced price, by feeding them up to the point at which they would bring the maximum figure in the American cities, is not very intelligible.

While it is thus clear that the Clydesdale is fulfilling a very useful purpose in relation to the foreign demand, it will be made equally plain that the American markets, as well as the actual requirements of both our own urban and rural demands, are by no means satisfied by the raising of heavy draught horses. The roadster, the carriage or "park" horse, and the hunter or saddle horse, are all wanted if they are only of the right stamp and quality, and will generally bring higher prices than horses of a heavier class. It may be well, however, here to examine the materials to hand for the production of the article the market in these respects requires:—

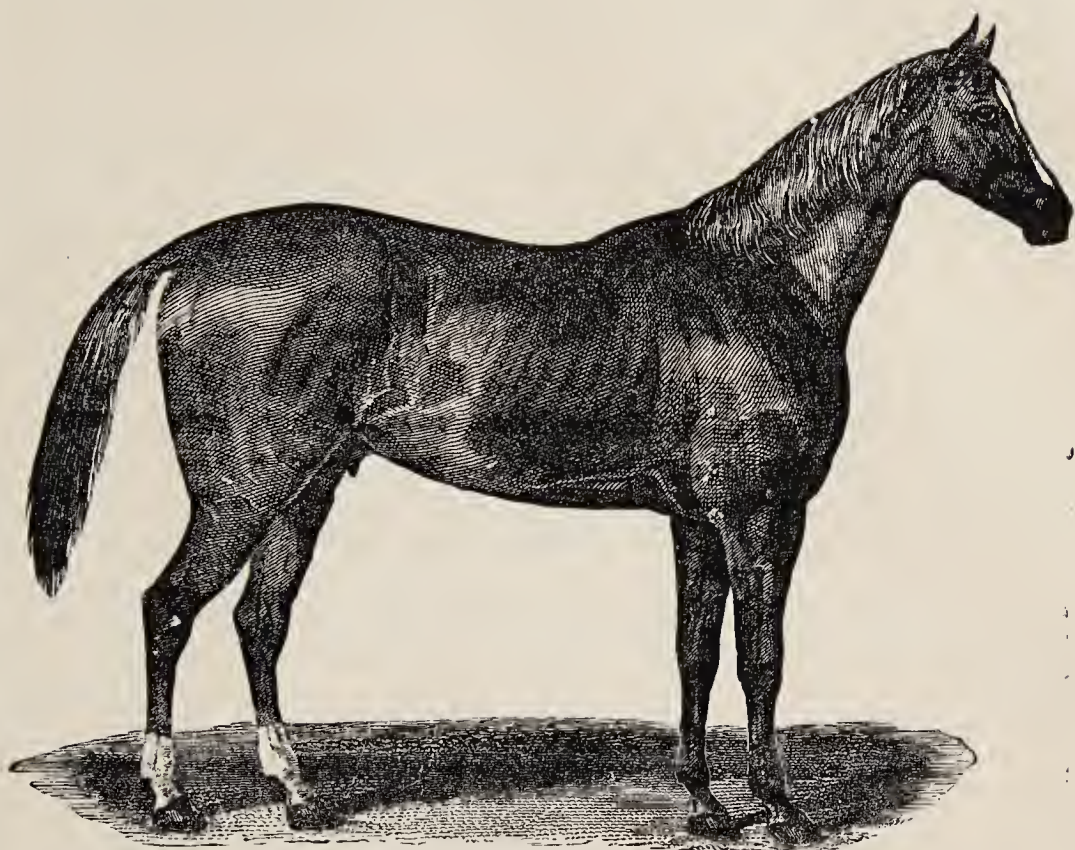
The Thoroughbred.

With regard to the "thoroughbred," Dr. McMonagle says:—

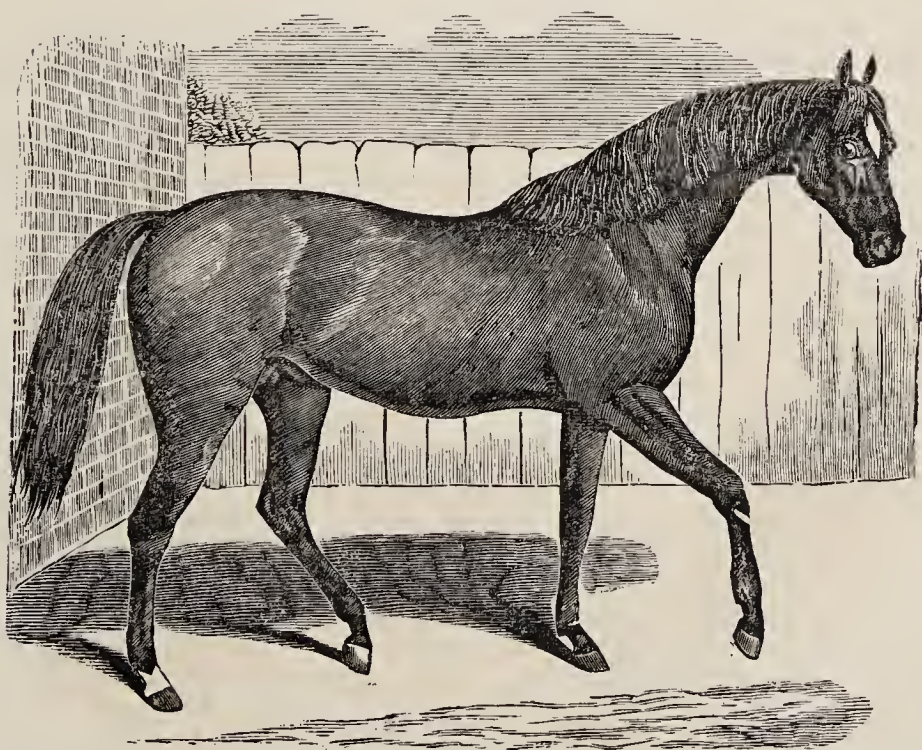
"The history of English thoroughbreds might well be touched upon here. England paid but little attention to the pedigrees or breed of horses until probably 180 years ago. The introduction of three horses into England—the Byerly Turk, the Darley, and Godolphin Arabian—which were crossed and recrossed on about twenty native mares, produced the grand thoroughbred, the pride of the British. The contests of this production in running races eliminated the weakest and resulted in the survival of the strongest."



THE ARAB HORSE.



"BOSTON."



"LEAMINGTON."

And then, after alluding to the institution of the English Stud Book, he goes on to say:—

“For accuracy and completeness the English Stud Book is the most remarkable compilation extant. The first volume is the basis on which the whole series rest, and from 1765 to the present time I believe the only addition to the English Stud Book has been one horse. The commingling of this blood at that time, for racing purposes, produced the English thoroughbred.”

The breeding of thoroughbreds is not carried on to any large extent in Ontario, partly for reasons to which Mr. Patteson refers. He says:—

“I should like it to be known that there are no more thoroughbred mares in this country now than there were twenty odd years ago. I suppose I have imported more thoroughbred mares than any other man now in this country, and I have found it necessary to sell nearly every one outside of it to the United States. I have even sent two bred here to Scotland. The reason for this is, that there is little encouragement to breed such horses here. Few men of leisure ride, and the thoroughbred is not meant for harness.

“Breeding thoroughbreds can only be made to pay by competition for prizes on the turf, and the turf has become so demoralized in Canada, that unless the old adage holds good, ‘when things are at the worst they mend,’ it may as well be abolished as pool-selling has been. There is no market for thoroughbreds in Canada.

“We have never produced a race-horse in Canada that has been at all first-class. One mare, indeed, we have in Toronto at present—Lady D’Arcy—who has taken second-class honours on the American turf, but there are no others worth mentioning. I am speaking of race-horses, not trotters.

“It is my opinion that without horse-racing, we shall never improve the breed of horses in Canada, and since the passing of the present Pool Bill, the pursuits of the turf have come almost to a stand-still. Without wagering you cannot get together a crowd of people to see a race, without gate money from the crowd you cannot pay the stakes, and without the stakes you will not get the breeding.”

The fact is, that, in Ontario, the use of the thoroughbred is virtually limited to his services to the breeder. When Mr. Patteson says “the thoroughbred is not meant for harness,” he rules the thoroughbred out of the reckoning for nearly every economical purpose in such a country as this. It is true that, when at Ottawa, the Commissioners saw, in Sheriff Powell’s stables, thoroughbreds, one, at least, of which might constantly be seen in harness in the streets of the city, while the whole group were as docile and approachable as greyhounds. But these are very rare cases indeed. As a rule, too, the tendency has been, for reasons well-known to sporting men, to breed the thoroughbreds *too fine*, and all ideas of a horse’s general utility are dispelled at once by the sight of most thoroughbred stallions.

The value of the thoroughbred for breeding purposes will be noticed further on.

The Pacers.

The evidence, however, shows very plainly, that, in Canada, there are to-day the descendants of horses with distinct characteristics of older standing in the history of British horseology than the Thoroughbred, and exercising a potent influence in the economy of horse breeding on this continent. Quoting from Dr. McMonagle's testimony, he is found saying:—

“According to Wallace (an authority on such matters) Polydore Virgil, an Italian ecclesiastic, wrote a history of the British Isles in Latin, which was published about 1509, and among other things, in describing the horses of that date, mentions “a great company of their horses do not trot, but amble and pace,” and he draws the distinction between pacers and trotters with unmistakable precision in sentences written 370 years ago. Another writer, Samuel Purchas, in 1625, indirectly verifies the historical conclusion that pacers were numerous in England at that date.”

It was not until the last century that the Thoroughbred became a factor in the improvement of the racing stock of England. Long before that happened, therefore, the horses referred to were recognized in England as a distinct breed. Although no record is forthcoming of the introduction of the pacer element into America, it is certain, that, as long since as 1730, a race of horses which must have been introduced into the American colonies by the early settlers from the mother country, became known as the Narragansett pacers. Dr. McMonagle says:—

“The Narragansett pacers had a line of heredity that gave them certainty of speed and a certainty of type as long ago as 1690. Their history in Virginia and Rhode Island shows that they were in-bred, and that they attained a rate of speed of less than 2:30 to the mile. It is known from the Rev. James McSparran, D.D., “America Dissected,” published in Dublin in 1753, that they were introduced into all parts of English America as long ago as 1730.”

Dr. McMonagle goes on to say:—

“The combination of these with French stock imported from France to Quebec in 1665, produced the Canadian pacers. Out of that combination we have the Pilots, which were taken to Kentucky, and proved to be the producers of some of the best trotting horses there. From the same stock we have the Columbuses, which were taken to Vermont, where they produced trotters, of which the fastest went at 2:19 $\frac{3}{4}$ —a daughter of Phil Sheridan, the most potent sire of the family. Copperbottom was taken from Canada to Kentucky, I think, in 1810. His blood permeates the veins of the famous “Rosalind,” 2:21 $\frac{3}{4}$. The Hiatogas belong to the same family of Canadian pacers, with a representation of 2:23. It is said the Tippos and Warriors also embody the pacing element, but there is not a certainty they do so.”

The Pilot-Pacers.

After discussing the pacing problem at some length, and showing that the trotting and pacing movements are interchangeable, Dr. McMonagle gives a history of the performances of members of the pacing family:—

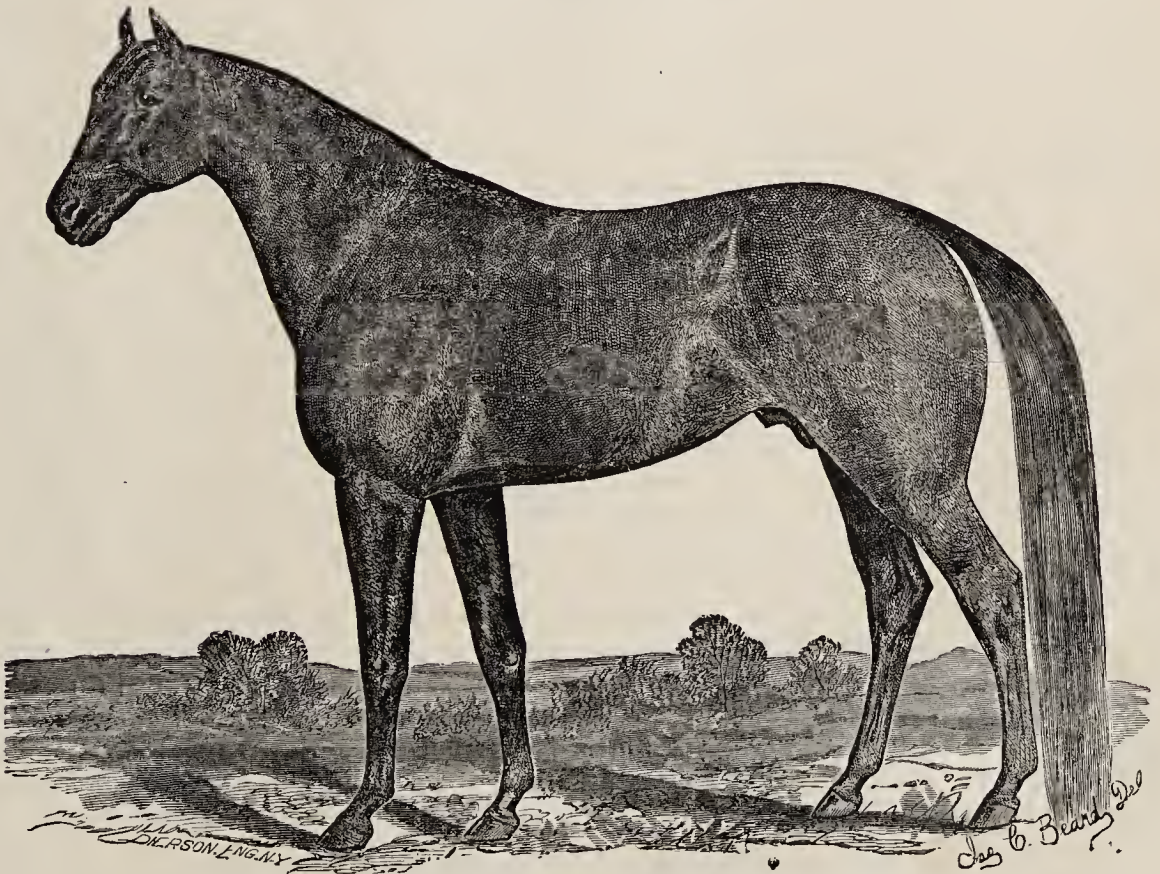
"In reference to Canadian pacers the facts are, old Pilot left Canada in a peddling cart and was afterwards developed at both gaits, and showed a purchaser 2:26 with 165 lbs. on his back. He founded a family, and out of the high-bred mare, Nancy Pope, produced Pilot Junior, with his seven representatives in the 2:30 list, his grandson, Tattler, producing two stallions, Indianapolis and Voltaire, each with 2:21 to his credit."

Maud S., who has made the fastest time on record, 2:10 $\frac{3}{4}$, is the daughter of Miss Russell, whose sire was Pilot Junior. Maud S. will be noticed in another connection presently.

Dr. McMonagle goes on to say:—

"Bonesetter, 2:19, belongs to the same family. Again, the original Copper-bottom was taken from Canada as early as 1810 or 1812, and 'was the first horse of his type taken to the blue grass region to improve the saddle gait.' Mr. Wallace says:—'He left a race of very valuable descendants, going all gaits.' Then again, a Canadian, Corbean, sired Corbean, that produced the fast pacer, Billy Boyce, 2:14, that did his quarters in 32 seconds. Still again, St. Clair, a pacer, 2:35, went from Canada, and through his son, Doc., produced the horse that cost ex-Governor Stanford, of California, \$5,000 to purchase, Occident, 2:16 $\frac{3}{4}$, the sensational trotter of 1873. The Yellow Jackets, that produced Thos. L. Young, 2:19, and Davy Crocketts, that produced Red Cloud, 2:18, carried with them from Canada the pacing inheritance."

The Columbus-Pacers.



"PHIL SHERIDAN."

Among the list above mentioned are the Columbuses. Of that family the witness speaks of Phil Sheridan as "the most potent sire." Of this horse he says:—

"The Columbuses were essentially Canadian, their trotting prepotency greatly intensified through Black Maria, a daughter of Harris' Hambletonian, being a dam of young Columbus, a stallion with six performers in the 2:30 list, and the sire of Phil Sheridan, 2:26½, with three performers in the 2:30 list; Phil himself, a legally naturalized Canadian, his dam Black Fly, bred at Irish Creek, Ont., being a lineal descendant of old Tippoo, (Phil Sheridan, the sire of Adelaide, 2:19¾, has done stud service in Eastern Ontario, in connection with the Rysdyk Stock Farm, for the last three years, and must in the near future have a perceptibly beneficial effect upon the trotting stock of that section.)"

The Bullock Horse and his Progeny.

The Doctor then goes on to describe another branch of the great Canadian pacing family. He says:—

"But unquestionably the most valuable of this element that left Canada, was the Bullock horse, a descendant of the Moscow tribe, indigenous sixty miles below Montreal, a horse that was taken from Laprairie to Rouse's Point, thence to Whitehall, where he sired North American, whose trotting inheritance became greatly intensified through his dam being by Harris' Hambletonian, a little gray mare with an injured hip; and doubly intensified in the pacing element, this little grey mare's dam being herself a pacer. The Bullock horse sired the Dalton horse, a chestnut gelding that stood sixteen hands high, pin-hipped, and first showed trotting speed in the hands of Mr. Kipp, who sold him to Mr. Tilliston, who nicked his tail. He sold him to Jake Adams for \$225, who in turn sold him to Andrew Dalton, who trotted him in races. He was bred at St. Hyacinthe, and looked very much like Old Moscow. He could trot on ice close to twenty, and was driven in a race by D. M. Jenkins in 2:36.

"North American was a dark brown horse, strong, 15:3 high, short back, standing erect, firm, straight, and with equal pressure on four heavy-boned limbs, and when at ease placed proportionately apart, with mathematical parallelogram precision, coarse head, long full tail, square buttocks, immensely muscled, with a sweeping, wide, open-gaited stride; when at speed, a trotter that did his mile to waggon at Island Park in 2:38, and so tenacious of his gait as to suffer extreme flagellations without leaving his feet. Bay York, a daughter bred by Sam Brady, was sent to Kentucky, and at Woodburn produced Bayard, 2:31¼, at five years old, who in turn sired Emma B., 2:23. Whitehall, a son of North American, produced Rhode Island, 2:23½, whose congress with Belle Brandon by Rysdyk's Hambletonian, produced Gov. Sprague 2:20½, at five years old, the centennial sensational trotter. A daughter of Sebastopol, son of North American, produced Maggie Briggs, 2:27, at five years old. America, by Whitehall, generated Nellie Holcomb, 2:28. Old Lady Rice, by Whitehall, begat Scott's Thomas, 2:21, and Scott's Chief, 2:23. Fanny Jackson, out of Betty Condon uniformly threw trotters to Daniel Lambert, of which the fastest is Aristos, 2:27¾. *Ivanhoe alias Yankee*, that won the twenty mile race against Empire State at Worcester, Mass., was by North American. It is through Lady Waltermire, a trotting daughter of North American, that this Canadian Bullock family has achieved such prominence and importance."

Mr. Aristides Welch, of Chestnut Hill, near Philadelphia, a breeder of great intelligence and astuteness, by uniting the Messenger element represented by

Rysdyk's Hambletonian, and the Lady Waltermire, above mentioned, produced the horse which Dr. McMonagle speaks of as

"A colt that had a natural pacing speed of better than 2:30 to the halter, a representative sire, the *matchless Strathmore*; the sire of Wiser's Chestnut Hill, 2:22, (sold), Steinway, two-year-old, 2:31½, and three-year-old, 2:25¾, a horse that sold last fall for \$13,000, and is doing stud service in California at \$300 each for the season; the sire also of Santa Claus with the best five-year-old record, 2:18, also standing for stud service in the State with a large patronage at \$500 each for his season's service."

For Strathmore the sum of \$24,999 was once, it is understood, offered and refused by his owner. Of Chestnut Hill, the son of Strathmore, the annexed plate is an illustration.

The St. Lawrences.

Another branch of the pacing family has yet to be noticed, the St. Lawrences. Of St. Lawrence, the evidence reads:—

"The origin of this branch of pacing-trotting proclivity was bred near Montreal, taken to New York State in 1848 by W. Prendergrast and sold to Joseph Hall, of Rochester, in 1853; was sold to Mr. January and taken to St. Louis, and there stood for \$200 the season, re-sold for \$3,500 and taken back to New York State; in 1857 was taken to Michigan and died at Kalamazoo in 1858. 'St. Lawrence was one of the earliest and most prominent of the Canadian breed brought over,' says Wallace, 'winning very many hotly contested races, and trotting well down in the thirties.' It cannot be said he founded a family, but he is certainly very nearly entitled to that distinction. He was a trotter himself and left trotters behind him.

"A noted instance of his ability to transmit his inheritance was through his son, Kinkead's St. Lawrence, whose daughter Fanny, from the result of a congress with Pilot Junior, produced that famous brood mare at Woodburn Farm, Water-witch, the dam of Mambrino Gift, 2:20, and Scotland, 2:22½; the double pacing and Canadian element from old Pilot, triply intensified, originating the former, and the psychological influence of the thoroughbred runner, imported Bonnie Scotland, on the pacing element, creating the latter. Another son, the Washburn horse, owned until death in Central Ontario, also proved his power of transmitting this inheritance, his progeny, Lady Suffolk, Balmy Bill, St. Lawrence Maid, and Lady Jane, doing actual campaign turf and ice service low down in the thirties, the latter winning the great five mile race at Mutchmoor Park, near Ottawa, in 1873, and St. Lawrence Maid trotting her mile on ice in 2:26."

The Washburn horse sired Moose, of which horse Dr. McMonagle says:—

"It is through the bay gelding Moose, the sensational circuit trotter of 1879, that the Washburn horse transmitted his strongest potency for speed. This great campaigner and winner was a fast trotter from his first *debut* on the turf, and at the present has obtained a record of 2:20¼, the fastest ever secured by a Canadian-bred horse, and now only equalled by the Royal George mare, Lucy, another wholly Canadian bred, obtained this season. Moose is owned by Robert Young, of Ottawa, and was bred by Mr. McGarr, at present of Smith's Falls. The mother of Moose was a mare brought from New York, formerly owned by John Morrissey, was used for turf purposes, said to be a Trustee mare, and was reputed to be able to show trials of speed as good as 2:34."

How the St. Lawrence element of which Moose is so distinguished a representative, may be perpetuated, is also shown, although, with Moose must terminate the line of descent so far as he is concerned.

After even this brief review of the history of the Canadian pacing element, it will not be difficult to agree with Dr. McMonagle, that "if properly husbanded, coupled, and crossed by Canadian breeders, it cannot help but be immensely productive in profits to the horse-breeding interest of Ontario."

Due to what circumstances and to what commingling of blood will be seen as the narrative proceeds, Ontario can boast two families of horses founded within her own borders, that are, beyond all question, eminently adapted for the purposes of the hour—the Royal Georges and the Clear Grits.

The Royal Georges.

The Royal Georges are thus described by Dr. McMonagle:—

"The class of horses in Ontario particularly, that have a type of their own, that are firm in their characteristics, that are undying in their habits, and that have always held their ancestral heredity in spite of all opposition, are the Royal Georges. They originated in the Tippoos, coming through Black Warrior, and contain within themselves characteristics that cannot be destroyed. They have size, form, velocity, longevity, and a type that leads to permanency in the family, a type that makes good carriage horses, and has of late produced some valuable trotters that trot close to twenty—campaigners, and winners. I have thought it possible that they could be the basis of a class of horses strictly Canadian, which, coupled with appropriately selected thoroughbreds, would produce the essential desideratum of the present day—the park or coach horse. The Canadian Royal Georges stand well on their limbs, they are large, muscular, have good, sound constitutions, and doubtless originally, in ancestral distance, had a pacing root.

The origin of the Royal Georges is given as follows:—

"The Tippoos and Royal Georges are, emphatically, a Canadian stock. They originated with Isaac Morden, of Prince Edward County, near Belleville or Napanee, in 1816 or 1818. The original founder was Tippoo, styled 'Old Black Tippoo.' He was the produce of a mare that was brought to Canada, it is said, from the United States, by a preacher, Mr. Howard. She was in foal when Mr. Morden obtained her from Mr. Howard, and she produced this black colt in the spring of 1817. The sire of Tippoo was never known, though it has been claimed, without proof, that he also belonged to the United States.

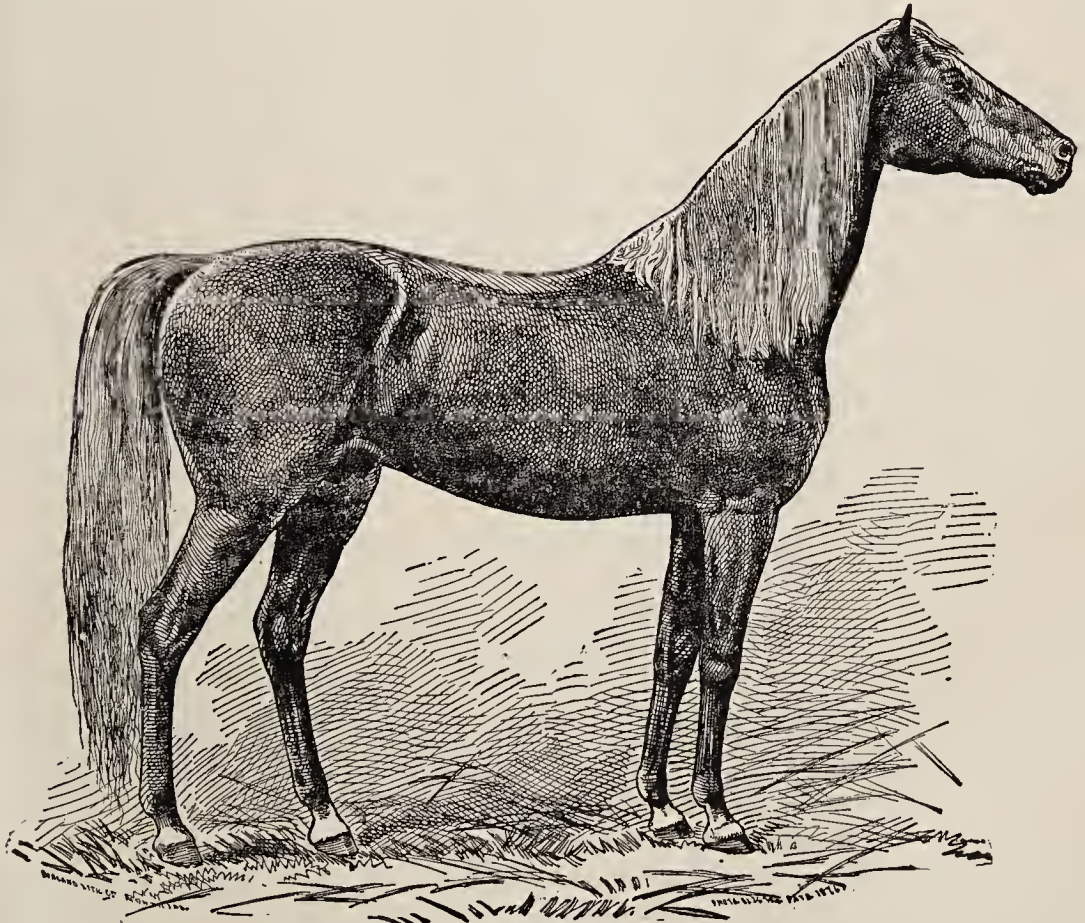
"From Tippoo we had Warrior. Warrior was a direct descendant of Tippoo. Warrior's mother was an English-bred mare belonging to an officer of the army in the 1st Royals. She was of the Warrior lineage, and was brown, although the Tippoo family were black, and from her we have a brown horse, which is known as 'Black Warrior.' His owner, Mr. Johnson, in 1840, intended to take the horse to Michigan, but on his way he got lame and was traded to a Mr. Barnes, living twenty miles south of London, who kept him until he died. Many of his get were pacers.

"From the veins of Warrior we have Royal George, and from the loins of Royal George we have the best breed of horses that ever lived in Canada. He pro-

duced Lady Byron, 2:28, Lady Hamilton, 2:30, Tartar, 2:28½, and Toronto Chief, 2:24½ (saddle); also Royal Revenge, and others that have produced trotters going as low as 2:20½, and selling in the market at as high as \$10,000. His family also include Caledonia Chief, 2:29½; Byron, 2:25½; Fred Hooper, 2:23; J. Ellis, 2:29; Lucy, 2:20¼; Belle of Toronto, 2:30; Neli, 2:27; John S. Clark, 2:30; Mike Jefferson, 2:29½; Fanny Jefferson, 2:28½; Thomas Jefferson, 2:23 (represented in the accompanying illustration); Commodore Nut, 2:29; Ben Flagler, 2:26½; Geo. F. Smith, 2:28; and many others not included in the 2:30 lists. The greatly dreaded old-time trotter Tacony, with a mile record of 2:26, and a two-mile one of 5:02—the winner of more than twenty hotly contested events—the conqueror of Flora Temple in two set races, was Canadian bred, by Sportsman, a son of old Tippoo. Another son of Tippoo, the Sager horse, got the fast mare Crazy Jane, 2:27; another, a grandson of old Tippoo, got J. H. Burke."

The descent of Royal George, on the dam's side, is thus referred to:—

"An early descendant of Messenger, Harris' Hambletonian, sometimes known as Bristol Hambletonian, produced two daughters, which Mr. Billington, of Middlebury, Vt., was taking to Detroit, and while travelling near London, Ontario, the off one permanently injured herself by getting her foot through a corduroy bridge, and became crippled for life. She was sold to Mr. Barnes, the then owner of Black Warrior, who lived twenty miles south of London, and became the dam of Royal George.



"WM. B. SMITH"—(ROYAL GEORGE).

"This was a dark bay or almost brown horse, fully sixteen hands high, and well proportioned. His head and neck were good, his body deep and round, joints large and strong, and legs and feet without fault or blemish. When Royal George

was three or four years old Mr. Barnes sold him to James Forshee, hence the 'Forshee horse.' During this period he was looked upon as a large, strong, handsome business horse, and a remarkably fine traveller, but nobody dreamed that anything fast would ever spring from him, or that he would found a Canadian family. Mr. Munger bought him from Mr. Forshee, and sold him to Mr. Dougherty, of St. Catharines, for \$400. It was Mr. Dougherty that gave him the name of Royal George. In 1858, W. H. Ashford, of Lewiston, N.Y., bought him and kept him there and at Buffalo two or three years. I think he was again repurchased by Mr. Dougherty, and died at St. Catharines in 1861. There is no tradition of his ever being in a race but once, and that at Hamilton on the ice in 1852, in a contest for a very considerable wager with the famous 'State of Maine.' Royal George won easily, and was not extended beyond a 2.50 clip."

Of the Royal George family, two stallions available for stud service in Ontario, at the present time, are prominently mentioned in the evidence. One of these, "Wm. B. Smith,"* is owned by Mr. Wiser, M.P., of Prescott. The services of this horse can be had at a very moderate fee. The other, "Erin Chief," also available at a most reasonable charge, is the property of Messrs. A. & R. Wells, of Aurora (York). Of "Wm. B. Smith," Mr. Wiser says in his evidence:—

"The horse I speak of is a descendant of Royal George, out of an imported mare. His name is Wm. B. Smith, and he was sired by Thomas Jefferson, a trotter with a record of 2:23, who, in turn, was sired by Toronto Chief, and he by Royal George. On the side of his dam, he is out of imported Heather Bloom by Tallyho. He is one of the kind of trotting stock from which I propose to breed our farm horses, those for lighter agricultural work. He is also of the kind to cross with the Messenger stock, so as to get the park horse, if we ever are to get it. He stands sixteen hands high, and is a bright chestnut colour. On my own track he has showed me a mile in 2:35, and a half-mile in 1:16."

Of Erin Chief, the following account has been obtained:—

"Erin Chief is a golden chestnut, 15½ hands high, weighing 1,200 pounds, with fine trotting action, requiring neither weights nor boots. He is a very bright, intelligent animal, and of a particularly docile disposition. He was got by Howe's Royal George, whose sire was Field's Royal George, son of Royal George, the founder of the family, who was, consequently, grandsire to Erin Chief. His dam was Erin Queen, daughter of imported Charon, a horse of distinguished pedigree."

Erin Chief has been nine years serving as a stud horse, having in that time sired no less than 400 colts, which show his characteristics in a remarkable degree. He has had very little training, but can, it is said, trot a mile in 2:30 or better. A considerable number of his progeny are stated to be able to show three minutes or better in their three-year-old form. Five or six that have been trained have done 2:30 on a first-class track. No less than forty-six of his progeny were exhibited at the Toronto Industrial Exhibition last fall.

Mr. Williams, deploring the rapid disappearance of Canadian families of horses, remarks that the Royal Georges are going in the same way. It is much to be hoped that such a result may be averted, and a family of horses so well qualified to give reputation to the horse-breeding industry of Canada, be carefully encouraged and maintained.

* See illustration, page 445.

The Clear Grits.

The Clear Grit family have been founded even more recently than the Royal George tribe. The venerable originator still lives, the property of Mr. George Whitely, of Seaforth, and the art of the photographer furnishes a picture of the old horse, as well as his worthy owner.

Clear Grit is the offspring of a thoroughbred horse, Lapidist (whose sire was Touchstone), and a pacing mare sired by a horse known as Cock of the Rock, a fact that leads to some learned speculation, and on which Dr. McMonagle founds an elaborate argument tending to show the tenacity of the transmitting element in the pacer tribe. Clear Grit, according to Dr. McMonagle, clearly inherited the pacing faculty. He says:—

“That Clear Grit himself paced is a matter of notoriety, as he frequently exercised in that gait on the Brantford track when owned by Mr. Mitchell, and had to be weighted on his fore feet to square away his gait to a trot. The groom of St. Patrick is my informant as to the mode of weighting both Clear Grit and his son St. Patrick.”

He goes on to say:—

“It is useless to deny—nobody denies—every Canadian rejoices—that this son of Lapidist conveys (he still lives) to his progeny a valuable inheritance of speed that can be utilized in the production of roadsters, gentlemen’s drivers and turf performers. When we find two strains of blood combined in a trotting horse, in about equal proportions, we must consider these two strains singly, and determine what each has done of itself in producing trotters. If each strain has, in its own strength and without the assistance of the other, produced trotters, we are then at the end of the investigation, and conclude that both were positive forces in the production of that trotter. But if we find that one of the strains never produced a trotter except in combination with the other, then we may justly conclude that strain is only a negative element and may as well be displaced for something else.”

The conclusion of his argument is:—

“The pacer has an inheritance that has come down from a greater antiquity than the running horse, and it cannot be logically maintained to the contrary, but that the old pacing mare overshadowed Lapidist, and psychically, independently, transmitted her Narragansett inheritance to her son Clear Grit, Lapidist arousing her previous ancestral inheritance and securing a fixity and firmness of type.”

Mr. Patteson, however, puts in a plea for the thoroughbred as follows:—

“In speaking of thoroughbred stallions in Canada, I would wish to point out that the Royal George stallions, and Clear Grit and his sons, of whom I have seen much mention made during the course of the Commission’s inquiries, must, in my opinion, be allowed to trace a great deal of their excellence to the thoroughbred blood in their veins.

“The Clear Grit family traces to Lapidist and the Royal George horse Erin Chief, to the imported thoroughbred horse Charon; while both the Clear Grit and Erin Chief families are descendants of an imported horse called Blacklock, a thoroughbred brought into this neighbourhood, and originally known as Fidget.

"Both these families are pre-eminently trotting families, and when you take into account the thoroughbred blood in the veins of Rysdyk you may assume that there is no trotting blood of any value in this country, that is not so mixed with that of the thoroughbred, as to bear out what I say, viz., that thoroughbred blood is essential to its excellence. Consequently we ought, even for trotting purposes, to encourage the importation of thoroughbred stallions. All the great American trotting families, the Stars (Dexter), the Clays (Patchen), Hambletonians (Goldsmith Maid), boast of thoroughbred blood; while Lady Palmer, and others, were clean thoroughbreds themselves."

That the trotting element is a very marked characteristic of both the Clear Grits and Royal Georges is quite clear. In the *Toronto Globe*, of July 12th and 14th, the sporting editor gives some account of the Clear Grit family and their performances. His account of Clear Grit is as follows:—

"He turned out to be a marvellously plucky colt, and in time, after he had been nearly spoiled by bad handling, and after he had been banged about the streets of Toronto in a grocer's cart, he ultimately, after many vicissitudes, turned out to be a speedy trotter for his day, and, better than that, a horse that was sure to come to the front when once the heats were broken. He would stay all day, and never give up a race as long as he was allowed to stay in it. Though he still lives and is doing good service in the stud, his trotting days are long since past. I do not at the moment remember what record he secured while on the turf, but he is rated by good horsemen as able to beat '35' in his trotting days, while all who knew him unite in the opinion that he would have been very fast had he enjoyed the advantages of judicious handling from his colthood. He is a rangy, light-necked, and heavy-barrelled horse, rather remarkable for his widely spread gascons. Many who have seen him trot say he is the biggest gaited horse they ever saw, and that he carried his hind legs and feet very wide apart, while the front ones moved in a much narrower gauge.

"During the greater part of his career in the stud, Clear Grit, like nearly all other Canadian-bred stallions, covered all sorts of mares, good, bad, and indifferent, though, of course, those of the last mentioned classes greatly outnumbered those of the former. The first of his colts to come prominently into notice, so far as I have been able to learn, was Clothespin, a horse which, after showing a good turn of speed in Canada, went to the United States, and showed trials as good as 2:22 or better.

"In the summer of 1876 St. Patrick, a five-year-old son of Clear grit, trotted in remarkably good form at Woodbine Park, and, in 1877, showed a trial over Cleveland track in 2:22. He subsequently went wrong temporarily, and has not since distinguished himself upon the turf, though there appears to be no reason why he should not do so any time he may happen to be put in good hands and conditioned for a race.

"Next came the famous bay stallion Amber, by Clear Grit, out of a daughter of Royal Revenge (the latter a splendid sire of Royal George extraction). Amber was recently described in connection with the report of the Rochester spring meeting, and it is necessary to say but little concerning him. He is generally acknowledged to be the most beautiful animal now on the trotting turf, speeds without weights or artificial aids of any kind, and was never known to hit himself anywhere when trotting on anything bearing the slightest resemblance to a decent track. In speeding he takes a very long stride, but carries his hind feet far enough apart so that they pass clear outside of the front ones, and never clips a hair. He carries his head well up, gathers strongly and rapidly, and, in short his way of going can best be described as perfection itself. How fast he can trot I do not



"CLEAR GRIT"—PHOTOGRAPHED BY A. CALDER, SEAFORTH.

know. I saw him trot a mile at Rochester in $2.23\frac{1}{2}$, and it appeared to be no effort for him. I saw Johnny Gordon come to him trotting at a '20 clip, and yet Amber shook him off readily, without ever straightening his neck. He is a good-tempered, level-headed horse, though not a remarkably quick beginner. This, the most famous of the sons of Clear Grit, was sold last summer by Mr. Pilkey, of Brantford, who bred him, to Feek, of Syracuse, for \$3,000, and his present owner could have sold him at Rochester for \$10,000 in cash, had he wished to do so."

The writer winds up his description of a long list of Clear Grit's descendants as follows:—

"So much for the Clear Grits in Brantford and vicinity, but they are scattered over western Ontario in great numbers, and many of them are very promising. The Hamilton pacer, 'Dan' shows a strong inclination to trot, and shows a splendid gait in that way of going. All the descendants of Clear Grit have nearly the same way of going. With the exception of a few pacers they are wonderfully pure gaited, and travel wide behind like Amber. They are all long, open striders, nearly all of them are blood-like and stylish in appearance, all that have done anything upon the turf have proved themselves stayers of the staunchest type, and, in short, it appears to me that they are just what is required to cross with the descendants of old Messenger. From such a cross the breeder could hardly fail to secure game, staunch, and stylish roadsters, while, when he did happen to raise a fast colt, he would have one that would neither knock his legs to pieces nor break his spirit and constitution by carrying artificial weights before he had reached maturity."

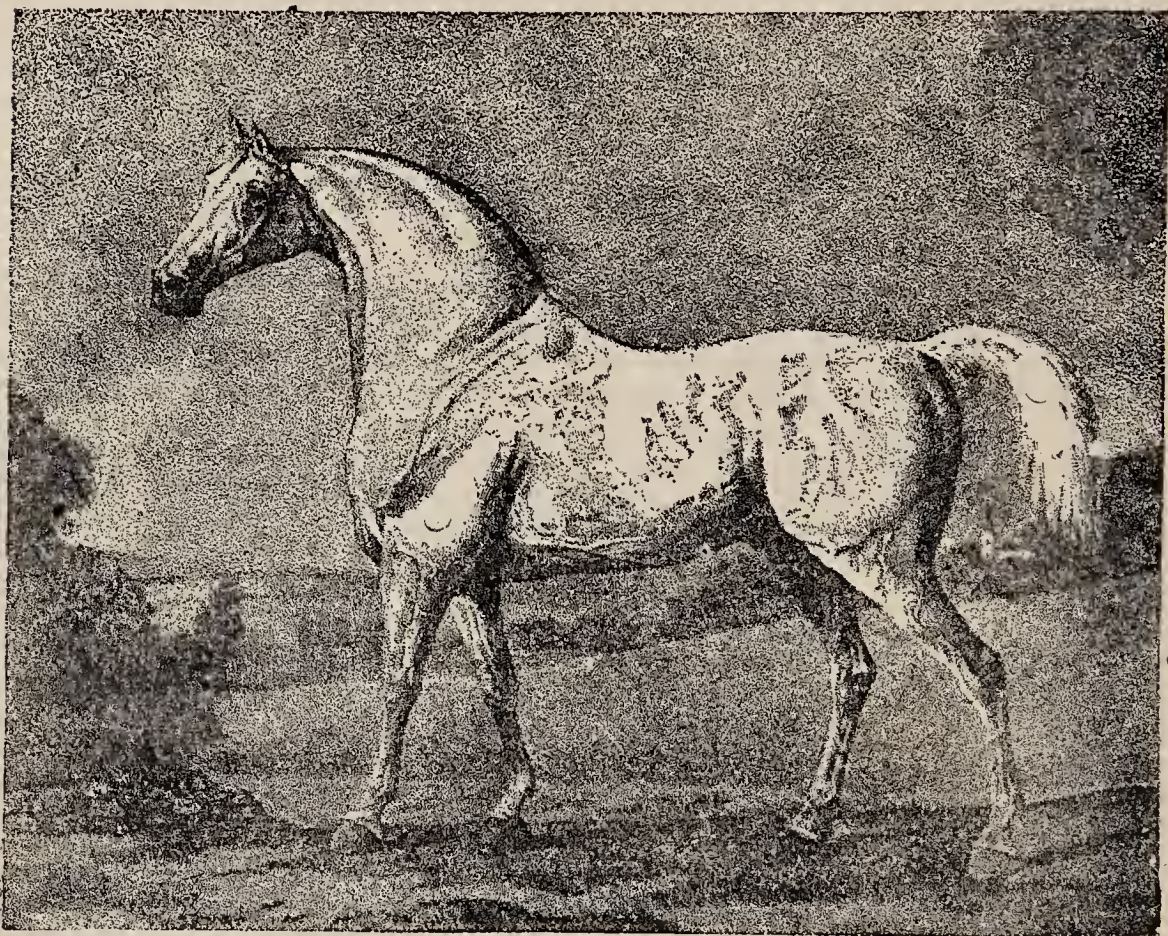
The Hambletonians.

It is to "the descendants of old Messenger," represented in this instance by the Hambletonian family, attention will now be directed.

In the year 1788, a thoroughbred horse named Messenger was imported from England to the United States. His pedigree showed him to be a direct descendant of the Darley Arabian. From the Darley Arabian came Flying Childers; from Childers, Blaze; from Blaze, Engineer; from Engineer, Mambrino (represented in the cut on the next page); and from Mambrino, Messenger. Of Messenger's history, after his arrival in America, Dr. McMonagle says:—

"Messenger was imported into this country in 1788, and he first arrived at Philadelphia. He served for twenty years, during seventeen of which the exact places where he stood, and at what prices, are known to posterity, as well as what mares he served during the last few years of his life. Wallace reprints a stud poster of March 1st, 1802, signed by Isaiah Burr and Benjamin R. Cooper, in which the second paragraph of the announcement reads as follows:—'Messenger proved himself a noted sire and foal getter when he stood in Pennsylvania, New Jersey, Long Island, and Goshen. His stock, some of which is selling from \$500 to \$2,000 each, are equal, or perhaps superior, to any other horse in the States.

"Mr. Van Ranst, his owner, put it on record forty-five years ago that, for a number of years, perhaps eight or ten, he leased his services for an annual rental, free of all expenses to him, of \$1,000 per annum. If we bear in mind that this was three-quarters of a century ago, that he was located each season in some section of the country that was essentially agricultural, and that the average



"MAMBRINO," SIRE OF "MESSENGER."

farmer could not then command one dollar as easily as he can ten now, we can begin to realize something of the magnitude of a net annual rental of \$1,000 for the services of a stallion in that day.

"It became noted shortly after his arrival, that he was a horse of real innate superiority, of peculiar prepotency, or a determination to convey to posterity not only what had been conferred upon himself, but an additional characteristic. He originated a type of horses almost entirely different from the family from which he came, unless the combination that produced Mambrino, the sire of Messenger, was an exception. He embodied 'all the blood of all the Howards,' and was the 'noblest Roman of them all.'

"One of Messenger's ancestors, it is said, had the faculty of straddling when on the run, and he conveyed that peculiar habit to his family. Messengers were all large, stylish horses, and although derived from a variety of sources on the dam's side, they generally followed the sire, and produced trotters that were not celebrated for speed particularly, but as roadsters.

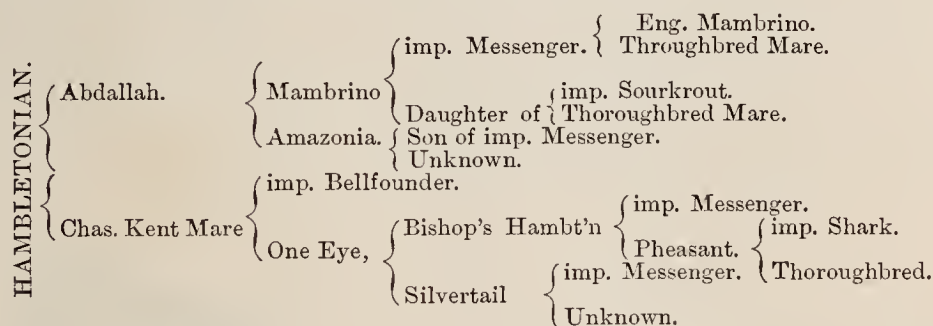
"In Rhode Island, in New York, and in New Jersey, there grew up a stock of horses known as the Messenger stock, and they were all sought at very high prices. The sons of Messenger were gathered up during the last few years of his life, and taken in all directions. Some were taken to Maine, and produced the Bush Messenger family. Ogden's Messenger was sired by imported Messenger, and stood for many years on the banks of the River St. Lawrence, across from

Morrisburg. It is claimed that Ogden's Messenger produced Tippoo, but that has not been proved to my satisfaction.

"Messenger had very many other sons, which went in different directions, and wherever they went they all seemed to impart an influence that produced strong, able drivers, and fine coach horses. The greatest of Messenger's second descendants was probably Tippoo Saib, Junior. It was demonstrated that if a Messenger's grandson and a Messenger's granddaughter were bred together, as in the case of Dutchman by the above sire out of Nettle by Black Messenger, they would produce trotters which would go three miles in 7:32½, an actual performance, standing unequalled for thirty-three years, when on September 21st, 1872, the great mare, Huntress, in-bred in the same line by Volunteer by Rysdyk's Hambletonian, reduced the three-mile feat to 7:21¾, which stands unequalled yet."

From Messenger came Mambrino; from Mambrino, Abdallah; and from Abdallah, Rysdyk's Hambletonian, the founder of the Hambletonian branch of the Abdallah-Messenger stock. Hambletonian, with the exception of one cross with imported Bellfounder, was strictly in-bred from Messenger.

His pedigree is supplied by Dr. McMonagle, as follows:—



"Two streams of Messenger blood unite in Abdallah, the sire of Hambletonian, and two streams unite in One Eye, his granddam, and these four streams unite in him."

Of imported Bellfounder it is said:—

"Imported Bellfounder—designated the 'wonderful Norfolk Trotter'—was imported from England by James Boott, and landed at Boston, Mass., in July, 1822. He was a bright bay with black legs, standing 15 hands high. His stud card of the following year says:—'His sire, old Bellfounder, was a true descendant of the original blood of the Fireaways, which breed of horses stands unrivalled for the saddle. Bellfounder is allowed by the best judges in Norfolk to be the fastest and best bred horse ever sent out of that county. At five years old he trotted 2 miles in 6 minutes, and in the following year was matched for 200 guineas to trot 9 miles in 30 minutes, which he won easily by 22 seconds.'"

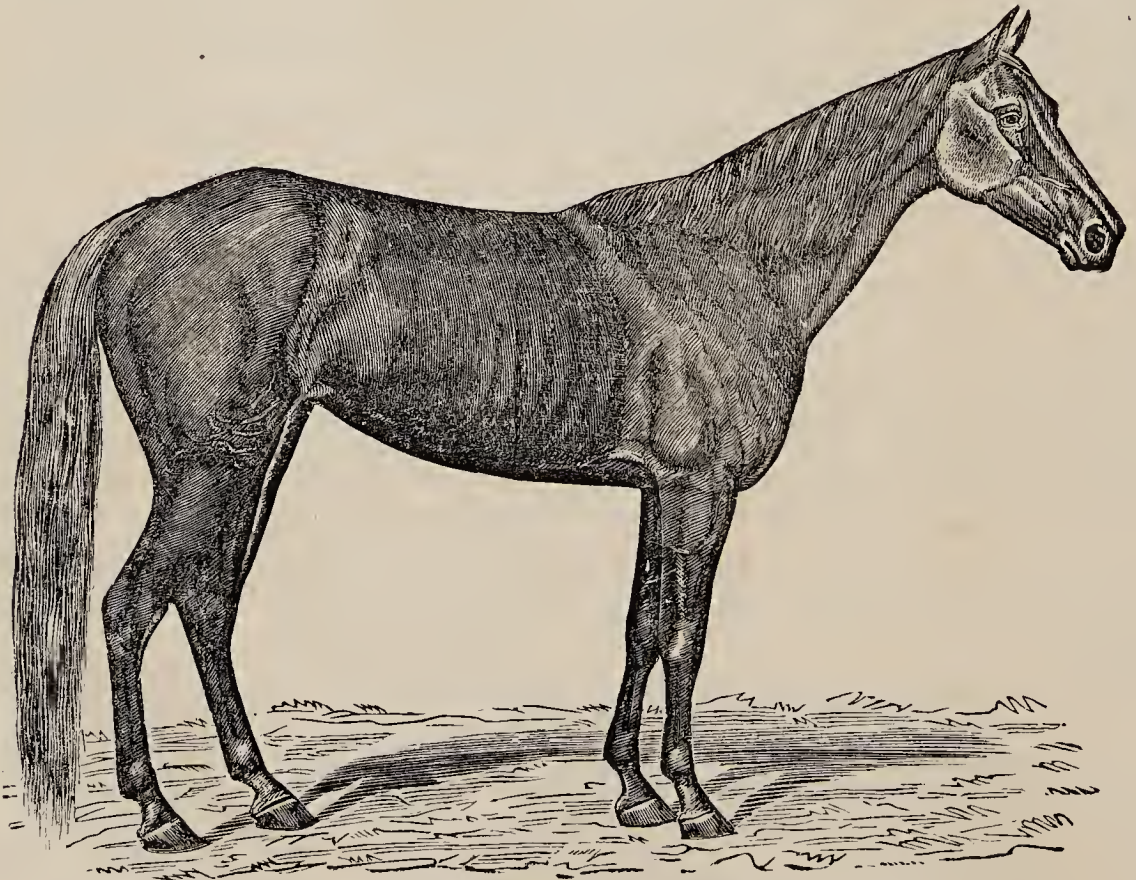
In calling attention to the merits of the Messenger-Hambletonian stock, the records of their performances and the prices they have been sold for, Mr. Wiser says:—

Of this stock Goldsmith's Maid, record 2:14, brought...	\$20,000
Dexter, record 2:17¼, brought	33,000
Jay Gould, record 2:20½, brought	30,000
Judge Fullerton, record 2:18, brought.....	15,000
George Wilkes, record 2:22, brought	16,000
Gazelle, record 2:21, brought.....	10,000
Rosalind, record 2:21¾, brought	20,000
Chas. Blackman, 4 months old, brought	5,000

Prospero, record 2:20, brought	\$25,000
Dame Trot, record 2:22, brought	10,000
Joe Elliott, no record, brought.	10,000
Bruno, record 2:29½, brought.	15,000
Startle, no record, brought	25,000
Robert Bonner, no record, brought	16,000
Dauntless, no record, brought	10,000
Happy Medium, no record, brought.	24,000
Socrates, no record, brought.	21,000
Edwart Everett, no record, brought.	20,000
Wallkill Chief, no record, brought....	10,000
Maud S., record, 2:11¾, brought... ..	21,000
Steinway, 2 yr. old, record 2:31½, and 3 yr. old record 2:25¾, brought.	13,000
Dick Swiveller, record 2:18, brought.....	16,000
Trinkett, 4 yr. old, record 2:19¾, brought	11,000

“I paid \$10,000 for Rysdyk with no record. These are only a few of the many that brought such large prices. It is the trotters of this family that make such performers on the American turf. As a family they have the best records, with the greatest number of performers, and the greatest number of heats within the 2:30 standard adopted by the National Association of Trotting Horse Breeders.”

Maud S., however, has, since the above evidence was given, achieved even a greater triumph in the unparalleled feat of trotting a mile in 2:10¾.



“ MAUD S.”—RECORD 2:10¾.



"RYSZYK."

The following are some of her performances :—

At Cincinnati, July 6th, in 2:34 class (4 starters), Maud S. won in three heats, 2:25, 2:30 and 2:28. Special purse at Chicago, July 24th, against Trinket, won in three heats, 2:19, 2:21 $\frac{1}{4}$ and 2:13 $\frac{1}{2}$.

At Buffalo, August 4th, 2:19 class (4 starters), Driver winning the first heat in 2:17 ; Maud S. the next three heats, 2:15 $\frac{1}{4}$, 2:16 $\frac{3}{4}$ and 2:16 $\frac{1}{2}$.

At Cleveland, 2:19 class (4 starters), three heats, Maud S., 2:24, 2:28 and 2:31.

At Springfield, purse to beat 2:12 $\frac{3}{4}$, Maud S., 2:20 $\frac{1}{2}$ and 2:19.

At Rochester, August 12th, purse to beat 2:12 $\frac{1}{2}$, Maud S., 2:11 $\frac{1}{4}$, 2:20. (St. Julian same day and track made 2:11 $\frac{3}{4}$.)

Chicago, September 18th, special purse to beat 2:11 $\frac{3}{4}$, Maud S., 2:10 $\frac{3}{4}$. This was her last race for the season.

Maud S. has already been noticed as inheriting pacing blood through her dam, Miss Russell, daughter of Pilot Junior. Her sire, Harold, is an in-bred Hambletonian, his dam, Enchantress, and his sire, Rysdyk's Hambletonian, being both by Abdallah, grandson of Messenger.

The chief representative of the Hambletonian family in Canada is Rysdyk, already mentioned as purchased by Mr. Wiser, M.P., for \$10,000, without record on the turf, but esteemed invaluable for breeding purposes.

Rysdyk is descended on the dam side from Lexington, a horse that, according to Dr. McMonagle, "has produced more runners at the running gait than any other stallion."

Lexington sired Lady Duke, of whom Dr. McMonagle says :—

"Aristides Welch, of Chestnut Hill, Philadelphia, is probably the most astute breeder of blooded horse stock in the United States, except Alexander, of Kentucky. He goes into the examination of pedigrees systematically and philosophically, and he will breed from nothing but what is pure and has a perceptible line of inheritance. He raised Lady Duke, who was by Lexington, and her pedigree shows that she came directly through Madoc, by American Eclipse, who was out of Miller's Damsel, by Messenger. Mr. Welch conceived the idea that if he could incorporate Messenger blood with thoroughbred blood, and further concentrate it with Hambletonian, which was in-bred Messenger (and when I say in-bred I refer only to sires), he would produce a model horse to breed from. He produced Rysdyk."

Dr. McMonagle adds as to Rysdyk :—

"Hambletonian is dead, and no other Rysdyk could be produced in the same way. This Rysdyk is extraordinary. He has a wealth of muscles in the gluteal regions that is simply immense. He has buttocks on him like a Short-horn bull. Rysdyk produces true to his type. To a learned man, and a man who studies the philosophy of breeding, he is a wonder. He breeds truthfully to his ancestral inheritance independent of what he meets on the dam's side."

Of the Hambletonians' performances, Dr. McMonagle says :—

"The Hambletonian family out of 20 performers trotting in 2:18, or better, is credited with one-half, and out of a total of 54 performers with records of 2:20,

or better, have 18, one-third of the whole number ; they have the best record of 2:12 $\frac{3}{4}$, with 1,653 heats, and 184 performers having records of 2:30, or better; and tested by that record, stand first in all the classes in 2:30 or better. Their progenitor, Rysdyk's Hambletonian, himself produced the incomparable number of 32 within the 2:30 standard—having 43 sons, sires of 2:30 trotters; 17 grandsons, sires of 2:30 trotters; and 4 great-grandsons, sires of 2:30 trotters, a prepotency guaranteeing breeders that his male descendants can impart with uniformity to their produce the best characteristics of their family and transmit those characteristics for successive generations, and, while remaining true to their original type, they not only effect an improvement in others, but an improvement in themselves.

“Along with the native type they will produce something dissimilar and superior from anything any other sire could produce. The Hambletonian is the Shorthorn of creation.”



“LEXINGTON.”

The Grey Eagles, Black Hawks, and Tippees (the latter an elder branch of the same family as the Royal Georges) are still represented in Canada, although the traces of their descent are, for want of any record, gradually being lost.

The Cleveland Bays.

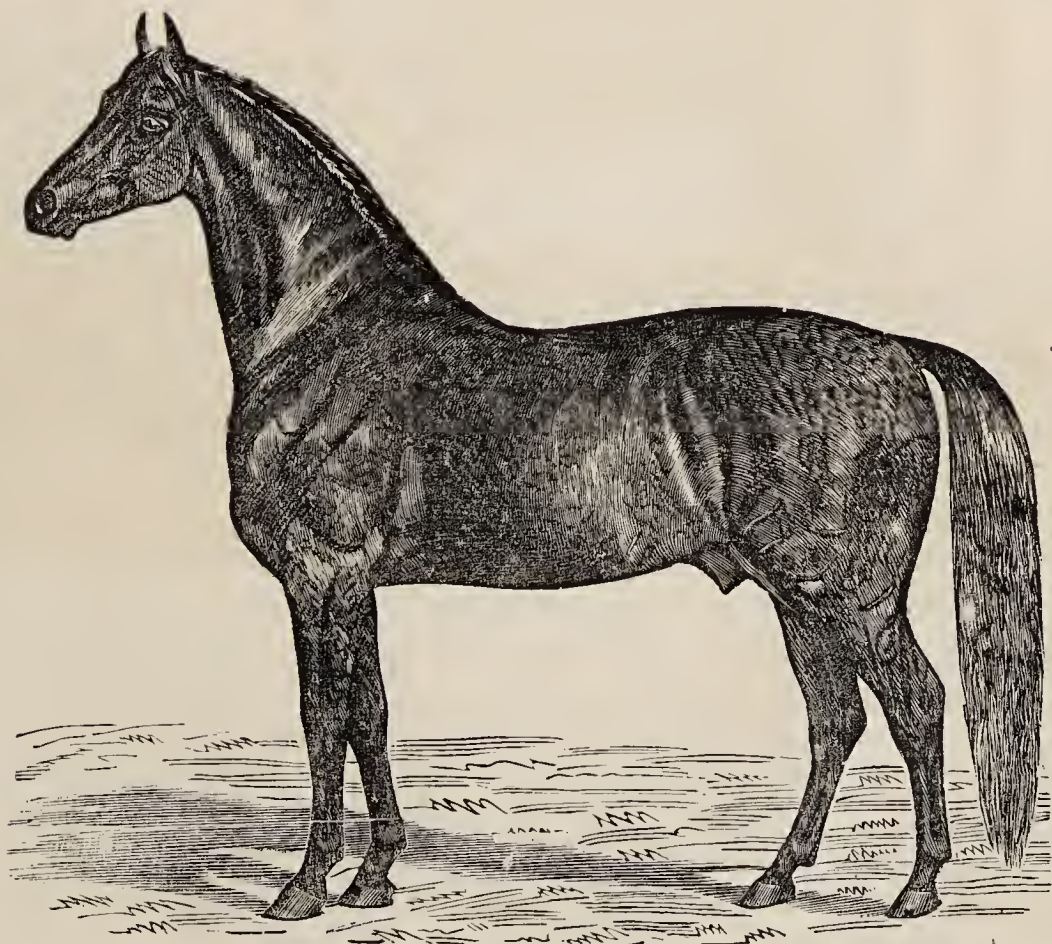
The Cleveland Bays originated, at an indefinitely distinct period, in the district of Yorkshire, England, that gives them their name. They were the old-fashioned coach horses of earlier days when roads were bad, coaches heavy, and speed of little

importance, while a certain dignity of style and action in the steeds was regarded as a proper accompaniment of travelling greatness. Dr. McMonagle in his evidence quotes Mr. George E. Brown, of Aurora, Illinois, in regard to these horses as follows:—

“Mr. Geo. E. Brown, of Aurora, Illinois, is the only American importer and breeder of Cleveland Bays so called. In endeavouring to produce the park horse he explains himself thus: “Having some knowledge of the Cleveland Bays, we were confident they would meet the requirements. We went to England and thoroughly investigated them, as well as the different breeds in Scotland and France. We also consulted with the best breeders, managers of large stage companies, and others largely interested in different horses. Our first conclusions were confirmed, and we commenced importing in 1875. We are well aware that many writers (some of them English) claim that the Cleveland Bays are extinct. In a certain sense this is true, and by the same reasoning Clyde and Norman are in the same fix, that is to say, not the same they were one hundred years ago.

“As originally bred the Cleveland Bay was a strong, coarse horse, weighing over 1,600 pounds; and used to haul the ponderous old stages over long routes. With the advent of steam those old stages were displaced by lighter vehicles, requiring lighter horses; consequently, during the past fifty years, the Cleveland Bay has been considerably reduced in size; in some cases by an infusion of the blood of the race horse, and in others by judicious selections of the finer families.”

Youatt, speaking of the improved Cleveland, says: “Now we have an animal with far more strength and treble the speed.”



CLEVELAND BAY.

Professor Low says: "It is the progressive mixture of the blood of horses of higher breeding, with those of the common race, that has produced the variety of coach horse usually termed the Cleveland Bay." The district of Cleveland owes its superiority in the production of this beautiful race of horses to the possession of a definite breed, formed, not by accidental mixture, but by continued cultivation.

In a word the original Cleveland Bay is no longer to be seen, but he is replaced by a horse suited, by the commingling of the thoroughbred with the old Cleveland blood, for the purposes of the times.

Mr. Patteson says of the Cleveland Bays:—

"There are not many Cleveland Bay stallions in the country. A few—perhaps not pure-bred—were exhibited both at Hamilton and Toronto at the late fairs. Those at the Toronto Exhibition were shown by a farmer named, I think, Somerville. There are no native pure-bred Cleveland Bays; in fact, I am not aware that there are any pure-bred mares of this class in the country at all. Mr. Abbott, of Montreal, imported two pure-bred mares, but I know of no others.

"I should welcome the importation of Cleveland bay mares for the improvement of our carriage stock, but the most we can hope for is the stallion. The Cleveland stallion comes from the district in England indicated by his name, and a good prize-taking specimen can be got there for \$1,000."

Mr. Williams, however, says:—

"There are a few Cleveland Bays in this Province, but I do not think so highly of them as Mr. Patteson does. The few I have seen have usually been very deficient in action, while their colts have been raw-boned, very slow to mature, not very strong in constitution, and, while rather imposing in appearance, from a side view, make bad horses to follow. I have not seen the Cleveland Bays in the old country, and I am speaking merely of those that have been brought out here, as nearly pure-bred as they can be got, and their progeny. I think the breed is pretty well run out."

It is quite possible to reconcile, or at least account for, these rather conflicting statements. There is a great scarcity of Cleveland Bays, both in England and elsewhere, and nothing is more likely than that inferior horses, claiming to be improved Cleveland Bays, which have no such definite type or standard as some other breeds, should be palmed off upon the foreign buyer. On this point Mr. Geo. E. Brown, already quoted, says:—

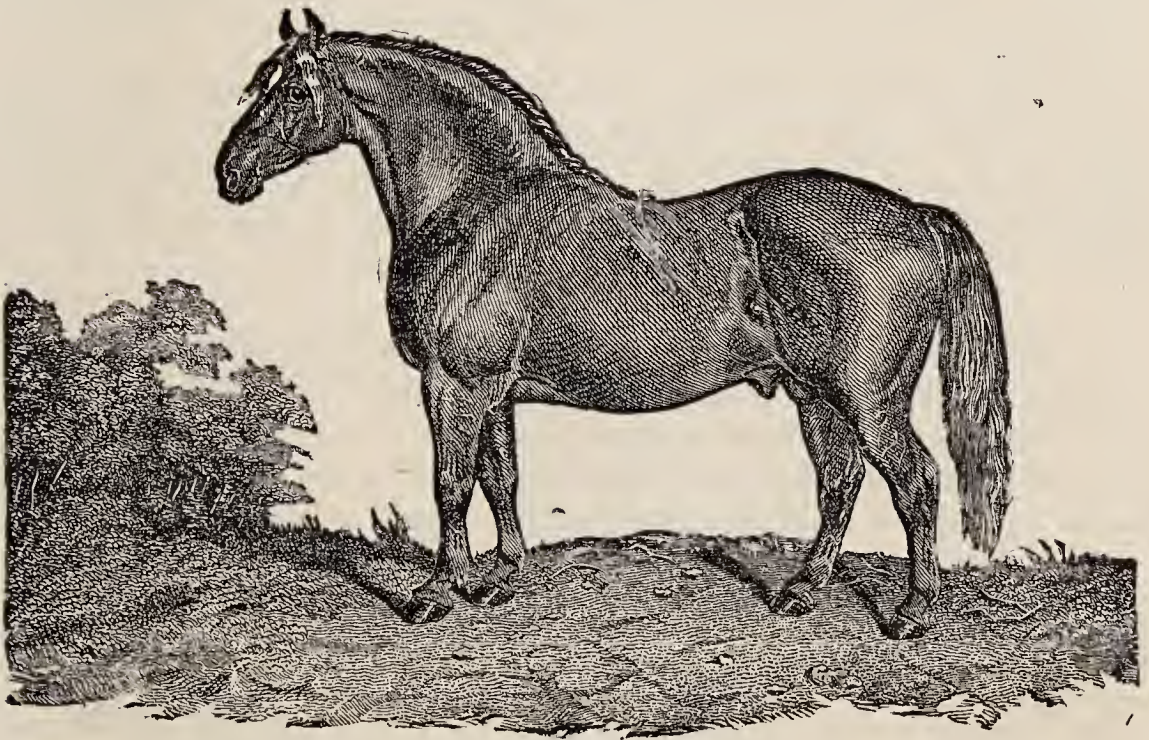
"Of late years the demand for hunters has been very great, and as Cleveland mares and thoroughbred stallions produce the most popular 'weight-carrying hunter,' they have been extensively bred in this way, and to-day even the improved Cleveland is very scarce, which has led to the assertion that they are extinct. But there are reliable breeders in Yorkshire, having mares descended from old and popular families, who take pains to secure the service of stallions of the same class. But even this cannot last long, for agents of the Russian, German and French governments are constantly scouring the country for large and strong 'nags' and Cleveland stallions, paying high prices, which accounts for their not being sooner introduced into this country. The improved Cleveland stands from 16½ to 16¾ hands high, and weighs from 1,350 to 1,450 pounds.

"It has been my good fortune to personally inspect some of the most popular stallions that have been acknowledged and patronized as Cleveland Bays by the most reliable breeders in Yorkshire, during the past fifteen or twenty years. Among them are 'Barnaby,' 'Lucks-All,' 'Champion,' 'Brilliant,' 'Emperor,' 'Wonderful Lad,' 'General Benefit,' and many others. Some of the above are owned there and doing service still, with many of their descendants.

"Stallions called 'Cleveland Bays' have no doubt been imported and failed of good results; but genuine Cleveland Bays have to my certain knowledge been imported and been eminently successful in producing just the 'model horse,' 'bay, 16 hands, weighing 1,200 pounds, with plenty of bone, symmetrical all over, 'action high and trappy,' yet he is at home on the reaper or threshing machine."

The Suffolk Punch.

Of the breeds of draught horses represented in Canada the Suffolk Punch is one of the most promising.



SUFFOLK PUNCH.

Mr. Patteson speaks of the Suffolk as follows:—

"I think the chestnut Suffolk stallion would immensely improve our general purpose and agricultural stock, and possibly even our dray and heavy-draught horses.

"The feet of the Clyde stallion are very inferior to those of the Suffolk; being either flat, or shelly, brittle, and split, whereas those of the Suffolk are as sound as a thoroughbred's, that is to say, their texture is very firm, close, elastic, and not liable to break. Again, a Suffolk has scarcely any more hair on his legs than a Cleveland Bay, and his weight is almost equal to that of the Clyde. There are Suffolk stallions quite as heavy as ordinary Clydes, but the general weight is less.

"I say that it would be wise not only to encourage the Suffolks as a breed,

but for crossing purposes I value them much beyond the Clydes, for the reason that the latter crossed with a common mare gets a mongrel, because the cross is too sudden and violent, and the contrast too strong. On the other hand the Suffolk does not present so severe a contrast to the ordinary mare as the Clyde, being naturally a much lighter timbered horse, of greater endurance, smoother shape, and without the cleft rump of the Clyde, and a cross with him would produce an animal good for agricultural, dray, or omnibus purposes, or in fact anything short of a hunter.

"I have seen many carriage horses bred by mating thoroughbred sires and Suffolk mares, and would not be surprised if that were the origin of the Cleveland Bay. A Suffolk horse of the proper kind is a chestnut resembling the Clyde in substance and contour, but has not the quantity of hair on the legs that the latter has, and which often serves to hide many imperfections and diseases. I should say the bone of the Suffolk is as big as that of the Clyde, but he is much like what a Clyde crossed twice with a Cleveland Bay would become. When I was last in England I saw great numbers of Suffolks in the county of that name, and in part of Norfolk. I hold not only that they are better horses for crossing purposes than the Clydes, but also that few fair specimens of the class have ever been imported into Ontario.

"A young Suffolk stallion can be bought in England for about 100 guineas, (\$500 to \$600) much the same price as would be paid for a Cleveland Bay. Mr. Simon Beattie has imported some Suffolks, and thinks highly of them; but the most of his have been sold out of the Province. Mr. Beattie, with a pair of Suffolk mares, once took the Provincial prize over all comers in the class for heavy teams."

The Clydesdales.

The Clydesdale is too well known in Ontario to need an elaborate description, although the views of his utility and adaptability to the wants of the country are interesting, and some of them have already been noticed. To the great importance attached in Great Britain to the purity of the breed of the Clydesdales, the following statement in Dr. McMonagle's evidence bears testimony:—

"On the importance of registration, so as to distinguish one stock from the other, and to keep each stock pure and free from the other, and to keep each stock pure and free from contamination, it was thought that the Clydesdales might deteriorate, owing to the want of proper protection by classification, and no less a man than the Earl of Dunmore has of late years originated a society in Scotland for the protection of the Clydesdales. Three years ago the Earl of Dunmore was elected president; 97 noblemen and gentlemen joined as life governors, paying ten guineas each; 57 life members paid five guineas each; and there were 44 annual members—altogether 198 members, producing an income for the Society of £1,112 for the first year. Their first volume, for a register of stallions only, had 1,400 entries, and the Earl of Dunmore generously paid the expenses of its printing, and gave each member a copy. The second volume appeared only a few months ago, and the same attention to detail which characterized the first volume has been maintained throughout. This volume contains a record of the colour, the dates of foaling, and all the marks."

Mr. Tumlin says:—

"A good many Clydes are being imported, some of them very good. We do not object to white on the hind legs, but we do not like it on the fore feet. Nearly all our large buyers in the United States are Jews, and they don't like a horse with white fore feet."

Mr. Wiser says :—

“Clydesdales are, I think, altogether the best strain to use upon our native mares to improve our draught horses. I should certainly stick very closely to them for that purpose. Of this stock I would strongly advise the use of imported or thorough-bred sires.”

Mr. Patteson says :—

“I think the tendency of horse breeders in Canada, at the present time, is to use Clyde, or heavy draught stallions too promiscuously, that is, not only with big, heavy mares, but upon small light mares as well.

“The best horse for actual draught that we have, is unquestionably the Clyde, as nearly pure as can be got. By draught horses, I understand you to mean such as are suitable for railway lorries, brewers’ and distillers’ waggons and drays, or fitted for taking about machines.”

Mr. Williams speaks somewhat critically of the Clydes. He says :—

“From what I have heard of them, and judging by the specimen I saw—which was imported by Senator Cochrane—I should say that the Suffolk has a better head than the Clyde, is cleaner cut out under the jawl, has a better neck, is generally deeper and better formed about the chest, has a vastly better barrel, has full round ribs instead of the slab sides of the Clyde, and is without the raggedness of the latter’s hips. The loin is broad and well muscled, the quarters are well rounded, the weight well carried back to the buttocks, the stifles heavy, the gaskons well spread, and the hocks well let down, and it is farther from the root of the tail to the bottom of the stifles. The Clydesdales are split up too much behind ever to make stylish or desirable horses, while the Suffolks give evidence of very much better breeding all over, being finer in the coat, and with legs comparatively smooth, and free from those gummy tissues and coarseness so common in the Clydesdales. The legs of the horse that Mr. Cochrane imported were as clean as those of a good roadster, while they had all the weight of bone and sinew of which any Clydesdale could boast. I would very strongly recommend the importation of the Suffolk Punch as a means of improving our horses.”

Mr. George Cockburn, of Baltimore (Northumberland), says :—

“I make a speciality of breeding horses. My preference in breeds is the Clydesdale, and though I have some blood horses, the most of my horses are draught. In 1872 we brought out a thoroughbred Clyde, and have been breeding Clydes ever since.

“I do not think the Clydes are deteriorating, but think, perhaps, they may be getting slower and colder-blooded, which is rather desirable, in order to make them steady working horses.”

Mr. Robert Beith, of Darlington (Durham), says :—

“The first Clydesdale mare I bought was five years ago, but previous to that I had been using pure Clyde stallions. For twenty-five years we have been using pure bred stallions, and high bred mares, and at one time we imported three stallions into the country. Lately I have imported the Clyde fillies and the colts. I do not think the Clydesdales deteriorate here, if they are kept pure and are judiciously crossed.

“We breed our own well-bred Canadian mares to the best Clydesdale stallions we can procure, and when the colts reach four years old they can be sold readily at from \$150 to \$200. These are heavy horses, weighing 1,000 to 1,500 pounds or thereabouts. I find them very useful on the farm, and when I wish to dispose of them, I can do so easily.

"I would not call them general-purpose horses. They are rather draught horses for the American market. I sell to jobbers or dealers. Good Clyde stallions at three years old are worth about \$1,000, bred from Canadian mares with four crosses in them."

Mr. Lawrie, of Malvern (York), who, in addition to the business of breeding Ayrshire cattle also raises pure-bred Clydesdales says:—

"I raise pure Clydesdale horses, chiefly for sale. I have at present a couple of mares and a couple of stallions that I brought out from Scotland. I think the Clydesdale stallion on the Canadian mare is the best cross you can get.

"My object in crossing the Clydesdale on the Canadian stock is to raise a general purpose horse. The lighter horses may be more suitable for certain purposes and where long journeys are necessary, but I think a farmer who keeps two or three span of horses should keep a span of Clydesdales and a span of light ones. We never find the Clydesdales too heavy for the market, and the pure heavy Clydesdale horses sell for more than any others. I raise about four horses every year. They are mostly of the same type, got by a thoroughbred Clydesdale stallion, and from as heavy mares as I can get. I go in for the heaviest make I can find. I usually sell my horses in Toronto; the Americans come here to buy them all the time, and I think, take them to New York. We find them equally saleable for the plough as we do for dray horses for the city. For a good draught horse I have frequently got as much as \$200 at three years old. Such a horse would weigh 1,300 or 1,400. The Clydesdales are bred here more numerously than any other class of horses. I think the produce of imported stock is as large as the imported stock itself. I do not think there is anything in the Canadian climate that reduces their size."

The Percherons.

The Percherons, in Ontario, are few in number although some very fine specimens of the breed are now to be met with. The Commissioners visited the large farm and horse-breeding establishment of Messrs. Hiram Walker & Sons, of Walkerville, near Windsor, in order to see some very fine Percherons purchased by them not long previously from a number imported from France by an American dealer.

Mr. Hiram Walker describes the Percheron as follows:—

"The Percheron is a snug, close-built horse, easily kept, has a quick action, is a fast walker, and, for a heavy horse, a fast trotter; he is good-tempered, and has great endurance. The majority are grey, but, in the lot I bought from, there were several black horses and some bays.

"To cross our stock, or even as they are, they will, in my opinion, make excellent general-purpose horses. They don't eat more than half what other horses eat to keep them in the same condition.

"Our Clydes, I think, would get better action and a lighter carriage if crossed with the Percheron. The Percheron has good bone and strength in compact compass. A Percheron horse weighing 1,800 pounds will go twenty miles as light as a pony.

"A properly selected, large, well-developed, light, common mare, crossed by a Percheron horse, should give a good carriage horse. I think the Percheron colts will be equal to any imported horses. We have a large number of mares in foal by Romulus."

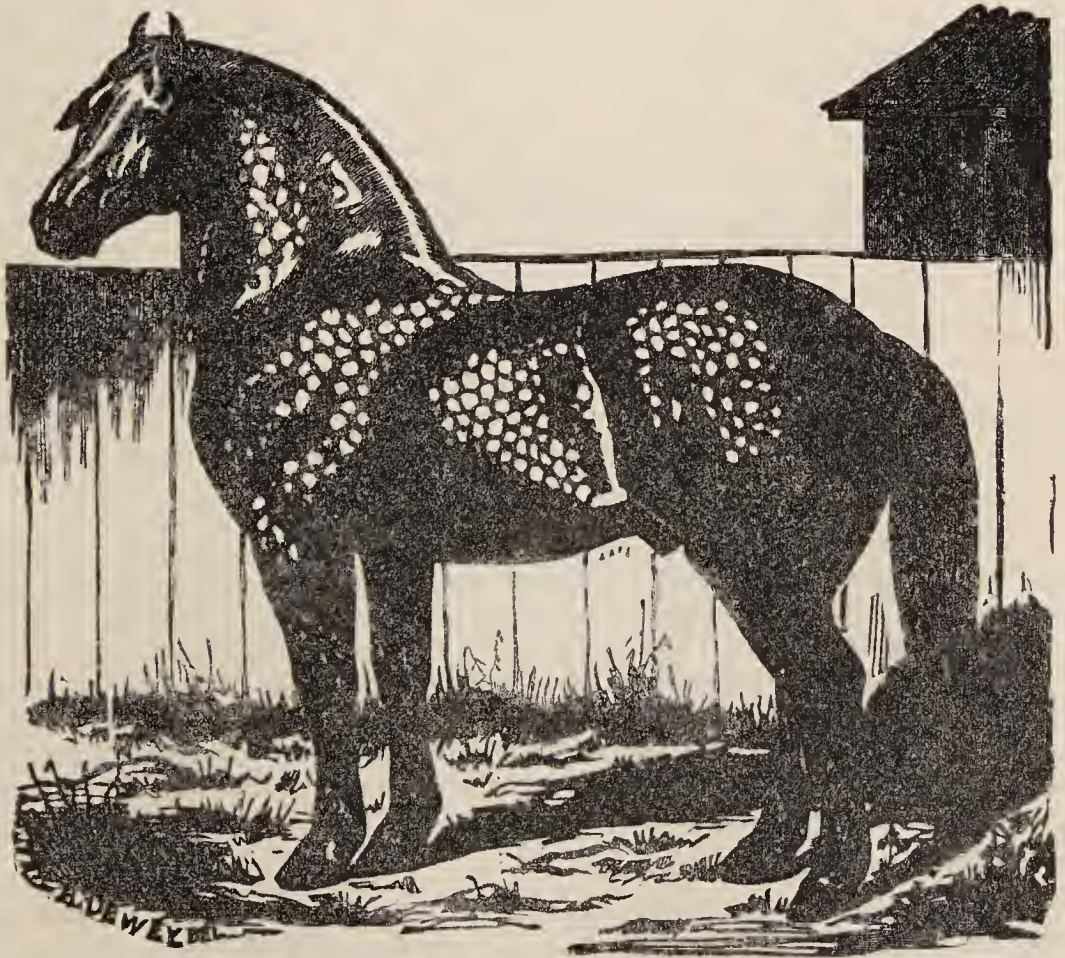
The horse in the accompanying cut, while in many respects a pretty faithful illustration, hardly conveys a just idea of the springiness and vivacity of the Percherons as represented in Messrs. Walker's stables. The latter consisted of one stallion, three mares and two colts. For Romulus, the firm had paid \$3,000, and for the mares \$1,000 each.

Mr. Walker described them as follows:—

"Romulus was foaled April 23rd, 1873. He was got by the (French) Government approved stallion Romulus, whose sire was the Government approved stallion Monarch. The dam of Romulus was a dapple-grey mare named Julia, sired by Romulus by Monarch. He is therefore in-bred from two famous horses, winners of all the great concourses of France in their time.

"He won the first prize and gold medal at the Universal Exposition of Paris in 1878, and in the same year nearly thirty other prizes, two for trotting. Romulus is a beautiful dapple-grey with heavy white mane and tail; he is a very fast walker which is a valuable characteristic of the Percheron horse; he has fine action, and is, for so heavy a horse, a wonderful trotter. He stands $16\frac{1}{4}$ hands high, and weighs about 1,700 pounds.

"The mares are known as Juno, foaled May 5th, 1875; Cozette, foaled March 23rd, 1875, and Fantine, foaled in the spring of 1874. We have got two colts from Fantine and Cozette respectively. Juno failed, but is now we think in foal, as are both the others."



THE PERCHERON.

The prepotency of the Percheron, when used to cover Canadian mares, has of course been tested only to a limited extent. What is said about them in the evidence must be to some extent speculative in its character.

Mr. Patteson says:—

"I have seen many horses of that class in France, but do not know anything about them in the same way as I do of the Suffolks. I saw a two-year-old at the show here this year, but he was easily beaten. I do not know who owned him. Mr. Watt exhibited a good one last year. The great fault of the Percheron is that he is inclined to be light in the middle, but his legs and feet are superior perhaps, to those of either the Clyde or the Suffolk. He is a hardy, active horse very sound and clean legged, but too often coarse in the head and sloping in the rump."

Dr. McMonagle does not speak very highly of the Percheron, as a horse to be used for the improvement of Canadian horses. He says:—

"With regard to Percherons, Mr. Harris, of Moorestown, N.J., was the first to import one into America—Diligence, purchased in Normandy in 1839. He imported two mares at the same time, and after several years of breeding, he came to the conclusion that they were not a success, that they would not commingle with the native horses of New Jersey, and all along the Atlantic coast from there to Florida they have been weeded out. Now there are many Percherons in Western Canada, Illinois, and Ohio. In themselves they may be a useful horse, but they are useless to cross with others. Last year the Russian Government appointed a Commission to make an investigation of the Percherons, and Professor Von Meddendorf, in his report, comes to this conclusion:—"We all know that most of the secret how to raise and train good horses consists in the knowledge of how to use the feed-bag from their most tender age; and when it is inquired where the original home of the Percheron is to be found, no vestige of any particular stock or race, but a feed-bag, filled half with oats and the other half with chaff and green fodder, was discovered by the explorers."

Mr. Houghton, looking at the matter perhaps a little less scientifically than Dr. McMonagle, says:—

"I have seen Percheron horses, but not very many of them; but from what I have seen of them, they appear to be a very nice horse—perhaps as close a made horse as the Clyde, very little lighter in the bone, and with more action."

Mr. Williams says:—

"I am a good deal at a loss to know what a Percheron really is. I have seen so-called Percherons that I could not see were any improvement on the Clydes. You will find Percherons brought out here weighing 2,000 pounds, and you will find them down to 1,300 or 1,400.

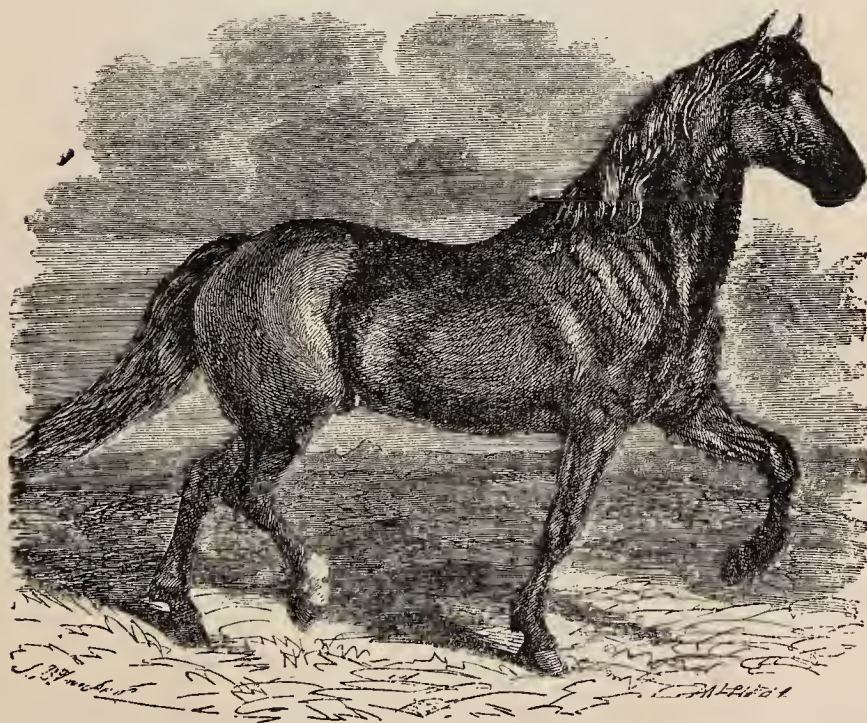
"Mr. Beattie, who has brought out a good many horses to this country, brought out a Percheron, called Marshal MacMahon, that I regarded as a very valuable horse to cross with our large mares, for the production of large, good horses. I have not seen Mr. Walker's stock at Walkerville."

Mr. Cockburn has been rather favourably impressed with the Percherons he has come in contact with. He says:—

"I have seen the Percherons, and think they would do well to improve our common breed. Their colour is a little against them, but it would not hurt them in the American market. They are not quite so good as the Clydesdales, as they



SHETLAND PONY.



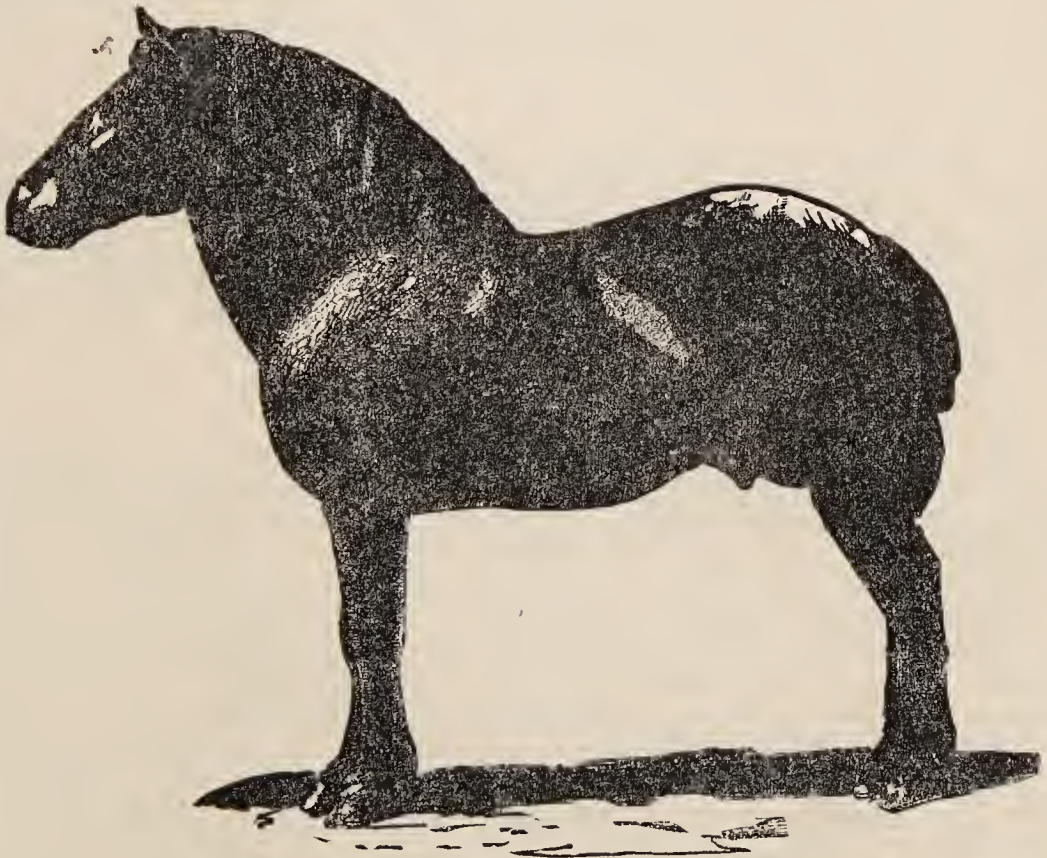
FRENCH CANADIAN HORSE.

are a little deficient in bone, when crossed on common mares. The Percheron mares, crossed with Clydesdale horses, would produce better stock."

Mr. Iler (Essex) gives a reason for the importation of Percherons into that county. He says:—

"We are importing some of the Percheron breed from the United States and France. The reason they have been imported is to give those raised from the Clydes a little more 'snap,' as the Percherons are considered to have a little better muscle and action. They are also hardier than the Clydes, and are fully as heavy. I think they came originally from Normandy. Two stallions have been imported from France. Mr. Walker's cost, I believe, \$3,000 in France, and Mr. Rankin's, \$2,000. These horses are considered more intelligent than Clydes, and the two I have mentioned are exceptionally fine animals. I don't know at what price a good ordinary stallion for service could be bought in France. For the services of these stallions one of these gentlemen charges \$20, and the other, \$30."

The Belgian horse, the French-Canadian horse and the Shetland Pony, are represented in the illustrations, but do not appear in the evidence as affecting the questions immediately under consideration.



BELGIAN DRAUGHT HORSE.

The next subject to consider is, how to utilize the several breeds or families of horses, in order to secure the classes in demand for home use, or for the foreign market.

The Roadster.

For the roadster there is always a good demand, at fair prices. The roadster is, in fact, the real general-purpose horse, such as has been already described, fit for any work on an ordinary farm, but able to make good time on the road when called upon, to the extent of ten, twelve or even fifteen miles an hour. The male of any one of the trotting families already mentioned, put to a strong active mare, with a dash of thoroughbred blood, will be likely to secure the horse that is wanted, in this class; one that will be useful on the farm, or for sale at home, is in constant demand in the United States, and that may, at any time, prove to be a fast trotter, worth many times the amount of the ordinary horse. Mr. Patteson says of the roadster:—

“As to roadsters, the American trotting stock, and some Canadian families which have been preserved, will produce all that is wanted, and we have that now in the Hambletonian, Royal Georges and Tippees. This class can safely be left to its own merits and unassisted progress, particularly as the habits of the people tend very much to its cultivation. Every man who has a little spare money likes to have a fast roadster, and I can see a great tendency to improvement in this class of horses, and some in riding horses, as such, more attention being paid to them by ‘Young Canada’ than formerly.”

Mr. Williams says:—

“In my opinion the excuse for the existence of the institution known as the trotting turf, is the production of these general purpose horses. They generally vary in height from 15 hands 1 inch to 16 hands, are moderate eaters, and although hearty, it does not take a small fortune to feed them; are closely and compactly made, hardy, free from disease, with plenty of style and action, and these are the horses that are left after the successful trotters are taken out of a breeding establishment.”

Mr. Wiser says:—

“For a horse which is not required for very heavy farm work, there should be a better plan of breeding. I would breed to some recognized trotting family strong in prepotency, and capable of producing its like. If you breed properly you will get a horse 15½ or 16 hands high, good for the road, and heavy enough for ordinary agricultural work. I am not speaking, of course, of heavy work.

“You would get a horse that would do for ploughing and such work as that, and would be able to go on the road and drive at the rate of twelve or even fourteen miles an hour if the roads were good. They would not only do for farm work, but they would always command a ready market at good prices. It would not do for such a purpose to cross thoroughbreds with the Clyde, as the Clyde is too heavy for road purposes. About six miles an hour is about as fast as you should drive Clydesdales; but if you want to go hastily to church, or to the mill, or to town, you require a horse that would be able to go at least ten or twelve miles an hour. For such a horse I would breed our native mares with some well-bred trotting sire, taking such natives as we can get and improve on them by using their progeny as dams for future breeding.

“We have an unlimited market for all that we can raise of such horses, I mean in the United States. The great trouble is that, if we happen to get good horses in Canada, buyers come from the other side and pick them up, leaving us



PARK OR COACH HORSE.

only the poorer ones. Most of our Eastern native stock have originated from crosses with thoroughbred running sires, and from these you get some degree of blood in nearly all of them. If you have a good horse you are always sure of a market, and the result has been to drain our country of its best horses.

"If I wanted a draught horse I would use a Clydesdale, and if a roadster, some recognized trotting stock. I would follow the breed up with a pure mare as closely as I considered advisable. I certainly would not cross a trotter with a grade draught horse."

In proportion to the breeding of the mare will be the probabilities of the issue of such a combination as has been suggested, turning out a superior horse. Ordinarily the result will be a useful, serviceable animal, in as good demand abroad as at home, and certain to realize a fair, if not an extraordinary price in the market.

The Park or Coach Horse.

A little confusion of ideas may perhaps be created by the use of the term "park horse," as the old English park or gentlemen's cab horse was certainly not precisely the one in the mind of the witnesses most earnest in recommending attention to the raising of the park horse in the present instance. The park horse, in their view, is some such a horse as the one in the accompanying illustration.

The requirements of the park horse are thus described by Dr. McMonagle:—

"A park horse should have a great deal of blood, and be able to trot a mile in $3\frac{1}{2}$ or 4 minutes. He should be a stylish bay, standing 16 hands or over, and weighing 1,200 pounds. He should stand erect on his forelegs, hold his head and tail high, and be perfect in symmetry and form. He must be large and broad in his hind quarters. He should be proud of himself, and dignified and elegant in his bearing, firm of flesh, sound in bone, not liable to spavin, straight in limb and standing squarely on his feet. Horses poorly bred generally wear the outside of the shoe first. Unless a horse stands square on his four feet, and wears his shoes evenly, he cannot maintain strength and durability."

The same witness goes on to say:—

"I think there is a way, however, in which we can breed a park horse. The Hambletonian being in-bred for such a series of generations, and being so strong in his type and character, impresses on his progeny what he receives from his ancestors. He would not fully impress his own characteristics upon them unless he had an affinity for their dam. In this country we have a great many thoroughbred horses crossed even to the tenth remove from the thoroughbred runners, and the way to utilize them is to unite them with the type we have got most akin to them. That type is the Hambletonian, which has been bred from the thoroughbred. To utilize the native stock we possess, we should unite them with either Royal Georges or Hambletonians, because we expect to have the same types meeting in their generation, and I found that result follow."

The following are then given as the points by which the park horse is to be judged:—

SCALE OF POINTS FOR JUDGING HORSES APPLIED TO THE PARK HORSE.

1.	Size, 16 hands being the standard	8
2.	Proportions, general symmetry and perfection of form.....	10
3.	Elegance and loftiness of style and carriage.....	10
4.	Colour dark, free from bad markings on the face or feet...	5
5.	Head clean, broad, expressive, and not too large	5
6.	Eye and ear bright, cheerful, and expressive of docility.....	5
7.	Neck, length, shape, and quality, with character of shoulders	5
8.	Back and loins	6
9.	Hip and whirlbone, and setting on of tail.....	5
10.	Quality of limbs and feet.....	10
11.	Action lofty, free and bold, knee well bent at speed.....	6
12.	Speed equal to a mile in 3:30 to road waggon	5
13.	Docility and kindness of temper.....	5
14.	Pedigree, showing an inheritance of the quality desired, and the consequent ability to transmit it.....	15
		<hr/> 100 <hr/>

Speaking of the park horse, Mr. Tumlin says:—

“If we could get the genuine park horse it would pay us well for export. When I get hold of a horse of that kind I find he will bring as much in New York as London or Liverpool—good up-standing horses, 15 to 16½ hands high, with good action, with a speed of eight to ten miles an hour, which may be increased to twelve miles an hour if necessary. When I said that the United States market for speed or trotting horses was glutted, I did not mean these at all. Horses of the class I speak of would bring \$150 to \$200, and if bred in the way I have mentioned would be as profitable as the Clydesdales.”

The mode to obtain the park or coach horse would probably be, in the present state of horse-breeding in Canada, to use a thoroughbred or trotting stallion on a large and well-selected native mare with some thoroughbred blood in her. Size and form of both sire and dam would have in that case, however, to be most carefully studied.

A surer method would, if available, probably be to secure a Cleveland Bay mare, and cross her with a thoroughbred or trotting horse, with either of which the thoroughbred blood in the improved Cleveland would readily assimilate. Mr. Beith makes a suggestion to that effect. He says:—

“I think the proper cross to produce coach horses is to cross a thoroughbred stallion and Cleveland Bay mares. That is the way the English coach horse is produced, and I have never seen anything to equal them.”

Mr. Williams would go a little further, even, for he says:—

“In order to produce horses of this kind, I would take any large well-formed mare, and breed her to a large heavy thoroughbred, several good specimens of which class we have in the country. I have now in my mind three thoroughbred stallions in Ontario that are big enough, when crossed with large mares, to produce fine stylish carriage-horses, that would stand sixteen hands at the age of four, and with action and general style which would suit them for the English market. I think the difficulty in producing this class of horses would rather be the scar-

city of mares than of horses. Our importers hardly pay attention enough to the importation of large mares.

"I would, however, breed from our own mares, and I would even use a good mare with a big dash of heavy Clydesdale blood in her for producing geldings and mares, but I would rigorously exclude any male progeny of hers from the stud."

This witness also suggests the use of the Suffolk Punch as an element in the production of the carriage horse. He says:—

"We have been marvellously successful in producing good horses of the roadster type, from perhaps rather scanty material, and I think the man who would have pluck enough to bring over a few Suffolk Punch mares, and breed them to well-bred trotting sires or fine stylish thoroughbred horses would, whether or not he made any money out of the transaction, have the satisfaction of founding a breed that would ultimately be of very great value to the country. There are persons in this country willing to pay a high price for a good horse, but the home market for high-priced animals is very limited, though a man can always get a good figure for a matched pair of stylish horses. I have seen \$700 offered for a matched pair, the equals of which I would think myself in pretty hard luck if I could not breed almost every time in the way I have described.

"Such horses are in good demand in the States; in fact, I have invariably found that a stylish, high-stepping carriage horse is always a saleable article. In fact the demand in the States is of such dimensions, that if every horse in Canada were turned out in the way I describe, I have no doubt an abundant market could be found for them there, without one having to cross the Atlantic."

Mr. Williams goes on to remark:—

"The cost to a farmer of raising a horse of this kind would be greater than that of raising a common animal by the increased fee for service, and no more.

"The following horses, crossed with large 16-hands mares would produce the class of animals I speak of. Messrs Burgess & Boyle's Princeton, Mr. Clarke's Magyar, Mr. Hendrie's Stockwood and Big Sandy, Major Macon (whose owner I do not know), Erin Chief, though not a very large horse himself, produces large stock, and I have no doubt Mr. Wiser's horse, Rysdyk, would be especially valuable in this way, for I have never seen any of his get from large mares that did not have exactly the style that was wanted."

Mr. Patteson strongly advocates the use of the Cleveland Bay in the production of the carriage horse. He says:—

"I should welcome the importation of Cleveland bay mares for the improvement of our carriage stock, but the most we can hope for is the stallion. The Cleveland stallion comes from the district in England indicated by his name, and a good prize-taking specimen can be got there for \$1,000.

"Bred to large bay mares, 16½ hands high—the more nearly resembling himself the better—he would produce London carriage horses for certain.

"In my opinion it cannot be too strongly impressed upon judges at exhibitions that the prizes in the carriage stallion class should, when possible, go to pure-bred imported Clevelands. At the Toronto Exhibition—I do not know who the judges were—the first prize for carriage stallions went to a very fine chestnut horse who was preferred by the judges to the Cleveland Bays exhibited. He was, no doubt, a good horse, but he had no distinctive breeding; he was of Royal George descent, valuable for general purposes, and would get roadster and trotting horses, perhaps, but he was not of the right colour to get horses for the English market. A pair of horses such as he would get could not be sold for much more than half the price that a pair sired by a good English coach horse would bring."

"To sell in England, a horse must have a good forehand, and a good but-end, and with the characteristics I have already sketched, mere speed is not much value in a dealer's eyes. If he has a stern on him such as the Royal Georges usually carry, I should say that he will, in that respect, quite come up to the mark."

It will be seen that while Mr. Patteson has in [his eye a valuable carriage horse for the English market, he is contemplating a heavier horse, with less speed at command, than the park horse of some other witnesses.

Precisely how the much desired park horse is to be obtained is a matter that must be determined by circumstances and the means at command. That the raising of such a horse would be profitable, and that it would secure an active demand is quite certain. The materials being to hand, the result will depend on the skill used in applying them.

A Ride and Drive Horse.

Mr. Patteson suggests the expediency of raising a horse differing a little from the park horse, although preserving some of the same characteristics—a horse he believes, and has found to be in good demand in England, and which he styles a ride and drive horse. Mr. Patteson says:—

"The horse for export to England is at present produced entirely by accident, being what is called a "chance" horse. He is of a different mould altogether from a horse generally considered valuable in this country; in fact, those horses which I have sent to England, and out of which I have made most money—getting guineas where I paid dollars—have been horses upon which the farmer or breeder set comparatively little value, and which they regarded as being worth much less than some straight shouldered, cross-bred machiner in their stable, or a shelly, weedy and often ugly animal, able to go at a 2:50 or 3-minute gait.

"These horses are generally picked out of farmers' teams, and have been got by a thoroughbred horse out of a pretty well-bred mare, partly of trotting and partly of coach blood. An English dealer will give you most money for a 'ride-and-drive' horse, with the qualities of a good hunter about him, and many of our farmers' horses are of just such a class.

"I will try to describe a model horse of this kind. He should weigh about 1,100 pounds, stand from 15-3 inches to 16 hands high—anything under 15-3 being classed as small—girth about six feet, the tendency in girth being to depth rather than width; should be short in the back, with very oblique shoulders, level quarters, high set tail, and legs planted well under him; of a good colour, with no objectionable markings; not more than six years old, and of course sound, and free from vice. Such an animal, up to 14 stone, would be worth 120 or 130 guineas, and can often be bought first-hand here for \$120 or \$130. Of course there are not many horses in this country which really come up to the standard I have indicated, and such as do exist have been bred entirely by chance.

"If I wanted to buy twenty such horses, I should go into those districts where, six or seven years ago, was located a thoroughbred stallion of fair size and substance, with good bone, flat legs and two good ends, and I should be quite sure to find there some horses of the class I have described. The stay, dash and



ENGLISH HUNTER.

thoroughbred characteristics in the progeny would come from the sire, while the mare herself, say half English coach-horse, and half roadster, with no actually cold blood, such as that of the cart horse or the Clyde, would give additional weight-carrying power, and mares of this kind are plentiful throughout the country."

Mr. Andrew Smith, V.S., the head of the Ontario Veterinary College speaks of a similar horse, probably, when he says:—

"There has been a great improvement during the last nineteen years in the saddle horses of Ontario. There are a number of good saddle horses in Toronto, which, for the most part, have been got by thoroughbred horses out of big, common, carriage mares. These may be called hunters, and for this class there is a fair market in Canada, and an excellent one in England. A good horse of this kind can be sold for \$200, but if sold before he is "made," he will not bring so much. Farmers, as a general thing, do not "make" hunters, but when in their prime there is no difficulty in obtaining from \$200 to \$250 apiece for good heavy weight-carrying horses of this kind. I would advise farmers to breed from heavy horses if they wish to make money."

Major Peters, of London, is also apparently disposed to encourage the breeding of some such horse, when he says:—

"The Irish hunter is got I think from a thoroughbred cross on a carriage mare. The English hunter is got in much the same way, but it is a finer breed.

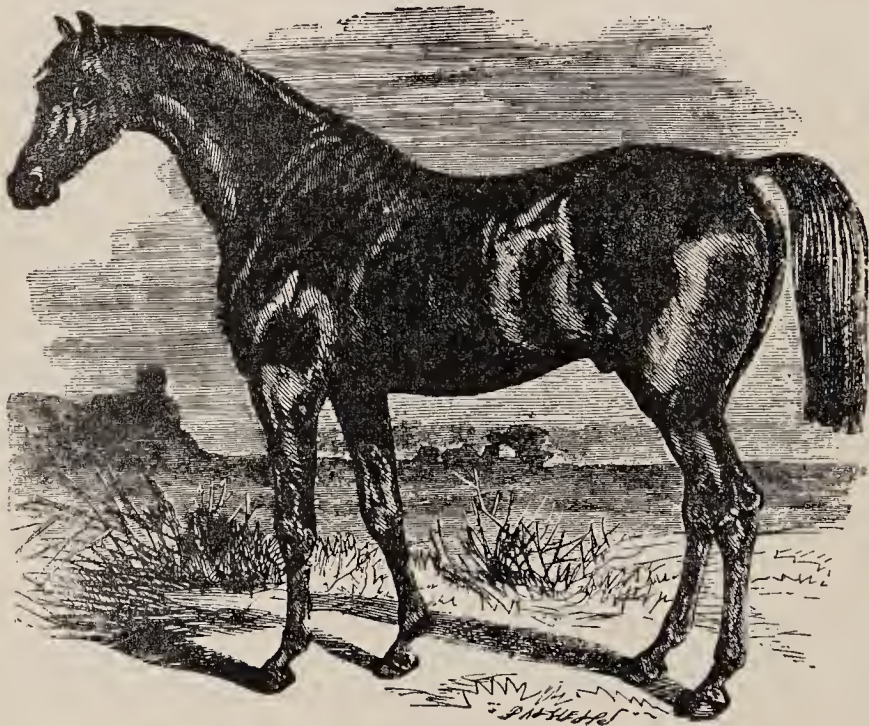
"I would recommend a good thoroughbred stallion, that would weigh at least 1,200 pounds, and stands not less than sixteen hands high, to cross on the common Canadian mares. That would produce a serviceable horse, both for speed and strength, and would export well.

"I have sold some very valuable horses, bred from thoroughbred horses on good carriage mares. I had a mare got from a cross on the Royal George. I put her to a thoroughbred, and I sold the colt for \$300. The highest price I ever got for a span of carriage horses was \$550. Young stock of that class would not sell at all; they must be kept to a certain age. If a person was breeding a certain class of horses and got up his name for them, it would pay him well to have an annual sale."

Such a horse as the one described in the illustration as an English hunter will be likely to come very near to the one the three last mentioned witnesses have in view. For a lighter saddle horse, however, one more nearly approaching to the cut on page 470 will be much appreciated.

The field for action in this respect is a wide one and enough has probably been said to direct attention into certain remunerative channels, and to utilize all the several classes of horses previously described. The farmer, if he attempts horse breeding, should make it a rule to breed for a distinct purpose,—to bring together no incongruous elements,—to use no horse that is not thoroughbred, or capable of transmitting the characteristics of a distinct breed, and to be content with nothing less than the best of its kind. By this means a superior description of every class will be identified with the horse-breeding interest of Ontario whether it be the heavy draught, the general purpose or roadster, the park horse or the hunter and saddle horse. The standard of value for Canadian horses generally

will be raised, with the possibility at times of large prices being obtained for those possessing speed, or form, in a more than usually marked degree.



FOR THE SADDLE.

One point of no little importance deserves attention, and that is the perpetuation of the several breeds or families of horses that are to be found in Canada at the present time as distinguished from the imported classes. Dr. McMonagle suggests as one means to this end in the case of the Clear Grit family, that it should be crossed with the Royal Georges and Hambletonians, with the view of obtaining horses that could be used to continue, retain, and transmit the valuable qualities of both.

Dr. McMonagle says:—

“The Clear Grit family for its continuation and retention, should be at once crossed with the Royal Georges and the Hambletonians. Clear Grit is doing stud service yet, and to make use of his power and inheritance, he should be coupled with such a brood mare as Wiser’s Jennie Rysdyk, whose sire and dam are both by the great trotting sire, Rysdyk’s Hambletonian. One, or two, or three, male progeny of such a lineage would confer incomputable benefits upon future Canadians.”

Mr. Williams says on this point:—

“This horse, Clear Grit is a wonderful foal-getter himself, and I think his progeny crossed with the Messengers would produce a horse as near perfection in the way of a roadster as it would be possible to obtain.

“The Messengers, though a very perfect race of trotters, are, very many of them, inclined to travel a little close behind, while the Clear Grits and the get of Lapidist generally, travel rather too wide behind, so that I believe a cross between

the two would produce a horse whose hind feet in speeding would just clear his front ones on the outside, and would do away with the necessity for shin boots, toe weights and all that sort of thing."

A Race of Ponies.

Among some of the interesting items of information imparted to the Commission by Dr. McMonagle was the history of a race of ponies planted on this continent, and useful for children or light-draught purposes. Dr. McMonagle says:—

"There is a family of ponies called the Chincoteague. Their origin is beyond the present knowledge of man. There are two islands in the Atlantic, off the coast of Maryland and Virginia, the larger being called Chincoteague and the other Assoteague. The ponies were found upon these islands when they were originally discovered. Tradition has it that the first of the ponies swam in from the sea. They have been there more than two hundred years, running at large winter and summer. The owners, once a year, drive them into a pen, and mark them, so as to distinguish their own. They are about thirteen hands high; are even in size and height; in colour are grey, bay, brown, black, and pale sorrel; have no white markings; their manes and tails are full; they have no fetlock hair; their fore legs are straight at the knees; their hind legs are crooked, the hocks converging and the toes pointing outward; their legs are clean and hard, and their feet round, with open heels. In 1670 the island was first prospected. It was subsequently granted by James II. to one person, and eventually subdivided. At present Kendal Jester holds 600 acres, and others have large holdings. In 1838 it began to be settled, and now there are about twenty-six houses on the island. These ponies are the essential pony of the United States. They are larger than the Shetland pony, and are used for children to drive, and for light-draught purposes. As a family of ponies, they are better than any I know. They are docile. They never kick. I have known them for about twenty years. A writer, named Howard Pyle, had an article about them in *Scribner's Monthly*, of April 1879. Stephen A. Douglass obtained a span of them years ago, and took them to Illinois. There are none of them in Canada."

In the evidence relating to horse-breeding and which, for the benefit of the farmer, it has been thought well also to print in the appendix containing the evidence on general farming, will be found a very full description of the Rysdyk stock farm, with its many and most complete appliances. The arrangements of the barns and stables, of paddocks, and of conveniences for breeding purposes, as well as the treatment of the stock, are all described at considerable length, and may be perused with great advantage by every farmer and breeder. As these will desire to follow out every detail it is unnecessary to reproduce any portion in this place. Either in Appendix G or Appendix K, the information referred to will be found *in extenso*. Some matters, however, relating to the general management of horses alluded to in the evidence may be noticed with advantage.

Cost of Raising a Colt.

Whether horse-breeding is profitable, or not, to the farmer will depend partly on the return he is able to obtain from the services of the horses he raises, and largely, of course, on the prices he is able to command for them. Dr. McMonagle puts the cost as under:—

“I buy everything in raising my horses, and I have kept accurate accounts of the expense incurred in raising different colts. The following is an estimate of the cost of raising a three year old colt:—In February it costs \$50 to get the mare with foal; \$28 to keep her until the next spring when she foals; \$20 for the pasture of the mare and the colt until the 19th of October, when I generally put them in, when the colt is ready to be weaned; \$17 to keep the colt until the next spring, when it is a yearling; and \$34 a year for the next two years. That makes a total of \$183 to bring the colt to the age of three years, and my colt Judge James, by Rysdyk, dam by Field's Royal George, I believe, with proper handling, is worth \$10,000 for speed purposes alone.”

In this case it will be seen: (1), That the price paid for service implies the expectation that the colt will be one of more than usual value; and, (2), that the witness buys everything at market rates.

Mr. Wiser who has, as already mentioned, a farm and all the facilities that implies, puts the cost of a colt at three years as follows:—

“As to the colt, I make the estimate upon a little different basis from that which most farmers would adopt in raising a horse. I make the cost of raising a good colt for general purposes, or agriculture, or as a roadster or trotter, \$71.90, when it is three years old. I first put in the service of the horse, \$10; keeping the colt till one year old, 20 bushels of oats, hay, say \$10. It is supposed to be running with its mother till it is five months old, and up to that time I make no charge for its keeping, but I think \$10 would be a fair figure. At two years old I would add 30 bushels of oats at 33 cents, which would be \$9.90, pasture \$6.50, 1¼ tons of hay at \$6, \$7.50. At three years old the hay would be 1½ tons, pasture would be \$7.50, and 35 bushels of oats, \$11.50; in all \$71.90.

“That colt should sell for \$100, with the chance that it may be worth \$500 or \$1,000, and sometimes you will strike one that is worth from \$4,000 to \$10,000 if bred in this manner.”

Mr. Wiser evidently comes nearer to the level of the ordinary farmer's experience.

Mr. Patteson does not hold out much prospect of profit on horse breeding as a business generally. He says:—

“I think horse raising, except for farm purposes, is not generally profitable. I hold that by the time a horse is five years old, before which time you cannot, as a rule, sell him, he has cost as much as can be got for him. About 5 per cent. of the horses now raised and sold, a little more than pay for their breeding; of the remainder, 25 per cent. may just cover outlay, and 75 per cent. fail to do so.

“It depends very much upon the class of horse what it costs to bring him to maturity. There are some breeds capable of earning their keep at two years old, especially well-bred Clydes. The breeding of a farm horse does not therefore cost so much as that of a carriage horse. By the time a hunter or carriage horse has reached maturity he will have cost his breeder as much as he will get for him,

and consequently he will have to look to the animal's manure and the incidental services he may have got out of him for his profit. It would not pay the exporter to give more than \$150 to \$175 for the animal, and it will have cost his breeder every cent of it to raise, break and bring him to market. An animal in this country at five years old is no more matured and seasoned than an English four-year-old. Keep and climate account for that.

"It would pay the farmer to treat his colts better; there would then be less risk and loss than there is."

Mr. Beith, who chiefly raises heavy horses of the Clyde stamp, says:—

"There is no reason why it would not be profitable to raise the heavy horses I have mentioned. For the eighteen months ending last March \$45,000 worth of this class of horses have been sold out of this country, and at the present there is a demand which we cannot supply.

"A horse of the large breed of which I was speaking would pay for its raising at three years old. It is better to break them in gently at that age. Horses which sell at three years of age for about \$150 to \$200 would cost about \$100 to raise. I have gone into pretty close calculations on that point. I take into account the cost of the stallion's services."

Age for Breeding Mares.

On this point Dr. McMonagle says, "The age at which a mare intended to be a breeder should be put to the horse is four years—not less than four."

Mr. Tumlin gives his views on this point as follows:—

"A mare intended for breeding should be put to the horse for the first time when from four to six years of age. If they were large ones I would commence to breed them at four years old. If the mare can be kept from working while she is with foal so much the better, but it will not hurt her to work moderately—such as ploughing or light teaming. Anything that will encourage the full play of the muscles just before foaling is better than idleness. In my experience as a breeder I have found that mares which are completely idle raise about one colt in three, whereas those which work a little hardly miss one. I think there is just about as little danger in having a horse brought forth in the open air as anywhere else."

Mr. Wiser says:—

"As a general thing I think it would be better that a mare intended for breeding purpose should be kept from the horse until she was four years old, though we breed at three or even two. I breed a good many two year olds and so do others. A good deal would depend on how the mare had been treated. If she was a good, strong, well-developed mare at two years old I should have no hesitation in putting her to the horse. I do not think it would injure her as a breeder, and I have seen as good colts from three year olds as from any other age."

Mr. Patteson gave as his opinion that a mare should breed,

"Before she has lapsed into worn-out old age, and before her parts have become so set as to make it inconvenient for her to produce a foal. No mare should be put to a horse before she is three years old, to produce a colt at four. If a mare be not put to the horse before she is so old as to be useless for anything else (a very general heresy) her first foal is generally produced with great difficulty, is

often decrepit and small, and is usually a more or less poor specimen, besides being liable to injury at birth, owing to the mare's want of expansiveness and elasticity. A mare intended for breeding purposes should have a foal when she is six or seven years old, otherwise there is, as a rule, considerable trouble at the first birth.

"I do not find any difficulty with young mares, because their parts are expansive, and accommodate the passage of the foal with much greater ease. If a small mare be put to a big horse, the difficulty is that the head of the foal is larger than the mare's economy had reason to expect from her own size, and her generative organs being made only to pass a foal with a head proportioned to her own size, considerable trouble often accompanies birth. A mare should always be left to foal unassisted—only helped in case of necessity."

Mr. Andrew Smith says:—

"A mare intended for breeding purposes might be put to the horse at the age of three; but I believe she will generally have a better colt if put to the horse when six or seven, or eight years old. In fact, I believe that when both sire and mare are fully developed in every way they are most likely to get good progeny."

It is important that care should be taken in regard to the horse used to a mare at her first covering, as the effect of that conception will be likely to remain long if not permanently on her constitution, and probably show itself in her future offspring. Mr. Wiser, being asked: "Would it injure a mare that you intended for thoroughbred breeding to put her first to a Clydesdale?" says:—

"Yes; most decidedly. The reason is that a habit is formed, and they derive a certain type from the breeding with a certain kind of horses. And this I think would affect at least a generation or two. I do not know that I could explain this on scientific principles, though breeders know it to be a fact. For instance I would not take one of my mares that I am breeding to my Hambletonian horse, the Royal George, or any other horse, for road or trotting purposes, and put her to a Clydesdale horse, and then go back to the others."

The witnesses appear to agree in the opinion that a Clyde or agricultural mare may be worked steadily and gently very close to the time of foaling, without injury and even with benefit. Thoroughbreds and roadsters will probably do best if not driven at all for three or four months before the birth of the colt. Mares, when suckling colts, should never be over-driven in any case.

Treatment of Colts.

On this subject Mr. Wiser says:—

"There is no greater mistake that our farmers have fallen into than their ideas about raising colts. They take them from the mare, turn them into the barn-yard or around the straw stack, giving them a little hay perhaps, allowing them to run out of doors.

"Many farmers say that the colt should never eat a grain of oats till it is three years old. A colt raised in that way will stand perhaps 12 or 13 hands high at one year old and weigh 500 pounds, whereas if you raise him in the proper way he will be 14 or 15 hands high and weigh about 900 pounds. It is a great mistake to suppose that oats are an injury to a colt. It is very seldom that

a colt gets tired of oats in their natural state, but they relish a change of food. I would give them carrots occasionally, though I do not think much of them. Some give colts bran, but I do not think it is much good, if they have plenty of oats.

“The treatment I speak of would apply throughout the first winter. They should eat, the first winter, at least four quarts of oats a day, two quarts in the morning and two at night. When they get a little older they should have a couple of quarts at noon. They should have all the hay they can eat, but they should not be tied up in stalls. You will never get good horses by breeding colts in the old-fashioned way of turning them out into the barn-yard or sheds in the cold winter weather. I would not tie up colts the first winter at all. They need all the exercise they can get, and it is unnatural to tie them. The longer you can keep a horse from tying him the better, and it would be best of all if horses were always kept in roomy boxes. They would rest better, move around easily, and roll over when they wished, but of course it is not always practicable to give them such boxes.”

Dr. McMonagle says:—

“A colt should be weaned at five months. The first winter it should be fed with all the hay and oats it can eat, and kept perfectly warm. *It is a mistake not to feed colts plenty of oats; it is nitrogenous food, and gives them plenty of flesh.* Old cut hay is not so good as hay that is cut while it is green and new. Corn and soft feed, such as turnips and carrots, are not nearly so good for nourishing them, and giving them endurance and vim, as hay and oats, and they will grow thirty per cent. more on the one kind than on the other. Probably once a week I would give them about a teaspoonful of saltpetre with a little wheat bran mash. There is no greater mistake than to water a horse directly after he eats his feed. His stomach is small, and any feed that he eats before you give him his drink will be washed through undigested. The proper way is to water him an hour or so before you feed him his grain. Colts do a great deal better with ground oats than with unground; the agitation of the mouth produces a certain amount of saliva that aids digestion. I have always kept my colts tied in their boxes.”

Mr. Patteson gives his opinion as follows:—

“I do not think a colt should be shut up alone until it is at least three months old. Sometimes the mare is taken out to work and the foal left behind in a box, but I do not think this advisable, because it limits the opportunities of the foal to suck his dam. From the nature of a foal's stomach and digestive organs, I should say that he ought to have constant access to his mother until he is three months old and begins to pick grass. A colt should be weaned at about the age of five months.”

“If early development and a high price be aimed at, and if sufficiently bred to warrant the expense, a colt for the first winter, should be fed on ‘kibbled’—that is steamed or crushed—oats, at the rate of about four quarts a day. I prefer oats treated in this way to oats in their natural condition; I have tried both ways, and I find, as a rule, that the colts are fatter and plumper if fed on either crushed or ‘kibbled’ oats. Besides this, bran, hay and carrots are to be given in moderate quantities, with constant access to water.

“I would tie young horses, and allow them to run loose, alternately. The sooner you can halter-break a young horse the better for all purposes, but I would not keep him always in the halter, and very little in the stall. I would tie him in a loose box occasionally, at other times allow him to run in it.”

Racks and Stalls.

With regard to stalls and racks, Mr. Wiser says :—

“Great care should be exercised in making box-stalls to have the edges of the upright sides of the place of entrance and exit rounded so that an animal will not be liable to strike his hip bones and injure himself, and that it be of sufficient height to prevent his striking the top with his head if he makes a sudden jerk back.

“There is not a rack upon my premises where a horse is fed from a hay-loft down. The stock is all fed from off the floor, and all dust and hay-seed are kept from them as much as possible. My method of feeding grain has always been out of an iron box placed in one corner of the stall, adjusted about three feet six inches from the floor. The box is made with such an edge on the inside as will prevent a horse from rooting out his oats and scattering them over the floor. With such iron concave rimmed boxes, it is utterly impossible to throw oats out of the box in eating.”

With regard to the number of services a stallion should be allowed to render in a season, opinions somewhat vary. Dr. McMonagle thinks eighty sufficient. He has a high-bred horse in his mind. Mr. Wiser suggests fifty or sixty for a thoroughbred or high-bred horse, and perhaps one hundred for a Clyde. Mr. Patteson argues that, however much excessive use may injure the stallion, it does not affect the foal, or so long as his potency lasts, prevent him from getting foals. Mr. Andrew Smith, speaking with professional authority, says :—

“I think entire horses should be restricted to a certain number of mares, say, from eighty to one hundred for the season, making possibly one hundred and twenty or one hundred and thirty coverings. A thoroughbred horse should have fewer mares than a Clyde. I think putting a horse to too many mares affects his progeny. I have known cases where horses were put to a great many mares, and although they got quite a number of foals, many of them were weakly, even where the mares were good, resulting from the sires being, to a certain extent, overdone. A horse put to an ordinary number of mares will get a much larger percentage of foals than where he is put to too many. If indulged too freely in covering, the effect on the horse is to make him impotent, and occasionally, to ruin him.”

No absolute rule can be laid down in this matter. The powers of some horses, particularly the more cold-blooded Clydes, are most extraordinary. It is, however, in the case of a valuable horse, with thoroughbred blood, the most prudent course to restrict him to some such number as the two first and the last named witnesses indicate. Whether the effect of excessive service be bad on the foals or not, the horse himself can certainly derive no benefit, and may derive much harm from it.



DORKINGS.

CHAPTER XI.

POULTRY AND EGGS.

The evidence relating to poultry and egg production in Ontario is not very voluminous, but contains in small compass a good deal of practical information. Owing largely to the efforts of the Ontario Poultry Association, many persons have made poultry breeding the subject of intelligent study, and it is probable that, should the creamery become as popular as the cheese factory, a further relief from the rather arduous labours of the dairy may enable the wives and daughters of our farmers to devote more attention, pleasantly and profitably, to the poultry house. The trade in eggs with the United States is already a considerable one, and capable of extension. The export of poultry has not yet attained large dimensions. The several breeds more particularly commended by the witnesses and their special merits, may first be noticed. For the illustrations the Commissioners have been indebted to the courtesy of Mr. W. H. Doel, J.P., of Doncaster, York; and Mr. James Fullerton, of the *Canadian Poultry Review*.

The Dorkings.

Mr. Doel is a warm admirer of the Dorkings. He says:—

“The breed which I would recommend for general purposes is the coloured Dorking. It is larger than the white Dorking, and is better adapted for the market. The coloured Dorking also comes to perfection for the table sooner than most other breeds, and there is more money in it that way.

“The Brahmas and Cochins are larger birds, but take much longer to come to perfection for the table than the Dorkings. The Dorking is plump and of excellent flesh. The Game is quite equal to the Dorking in quality, or perhaps more delicate; but the trouble with the Game is that you cannot keep so many Game fowls together as you can Dorkings. The Brahma, in flavour and quality, is very nearly if not quite equal to the Dorking. The flesh of the Cochin is too coarse and stringy to make it suitable for the table. If I were going into the keeping of fowls as a business, I should take the Dorking or a cross of the Brahma and the Dorking or some other breed, but I prefer the Dorking.

“The cross of the Brahma and the Dorking will give us a larger framed fowl than the Dorking, and with more flesh upon it, and makes a superior fowl in every way for the market.”

As to the mode of breeding the Brahma and Dorking, Mr. Doel says:—

“In breeding fowls I find that the cross generally receives its type from the

male. If I were breeding and crossing the Brahma and the Dorking, one year I should commence by crossing a Brahma cock and a Dorking hen; then in two years I should cross a Dorking cock and a Dorking-Brahma hen; and every two years I would cross in some full-bred cock, like the Houdan. I should rule out the Cochin entirely, on account of the inferior quality of its flesh. Under all circumstances I would always use a pure male bird, and never take a cross except one which has been bred for a number of years, and had become a very good type."

A want of hardiness is sometimes alleged as a defect in the Dorking; but Mr. Doel finds that, by allowing them to run out in all sorts of weather, they become as hardy as any other fowl. Nor has he found the crossing of the Dorking and the Brahma diminish the hardiness of the cross.

As to the size that may be attained by the union of the Brahma and the Dorking, Mr. Doel says:—

"Some time ago I gave some eggs from the cross of a Brahma cock and a Dorking hen, to a friend of mine, and she obtained from them a cockerel which was killed in the fall, and before it was picked it weighed nearly fourteen pounds. That was a bird that was worth something for the table, although it was an exception. A fair average of the weight of such a cross would be nine or ten pounds for the cocks, and six or seven pounds for the pullets, live weight, or about eight pounds for the cocks, and five pounds for pullets, dead weight. And then they come in earlier for the table than the full-bred Asiatic. They are improved in size, while the quality of the Dorking is not deteriorated in the cross."

Mr. James Anderson, of Puslinch, regards the Dorkings or the Plymouth Rocks as the finest table-birds in the list, although the Brahmas make the best mothers.

Mr. John Plummer, of London, on the other hand, has not found the Dorkings superior to other fowls for table purposes. He admits they fatten easily, but asserts they do not grow large. Their eggs, however, he says, have a fine flavour and their meat is good.

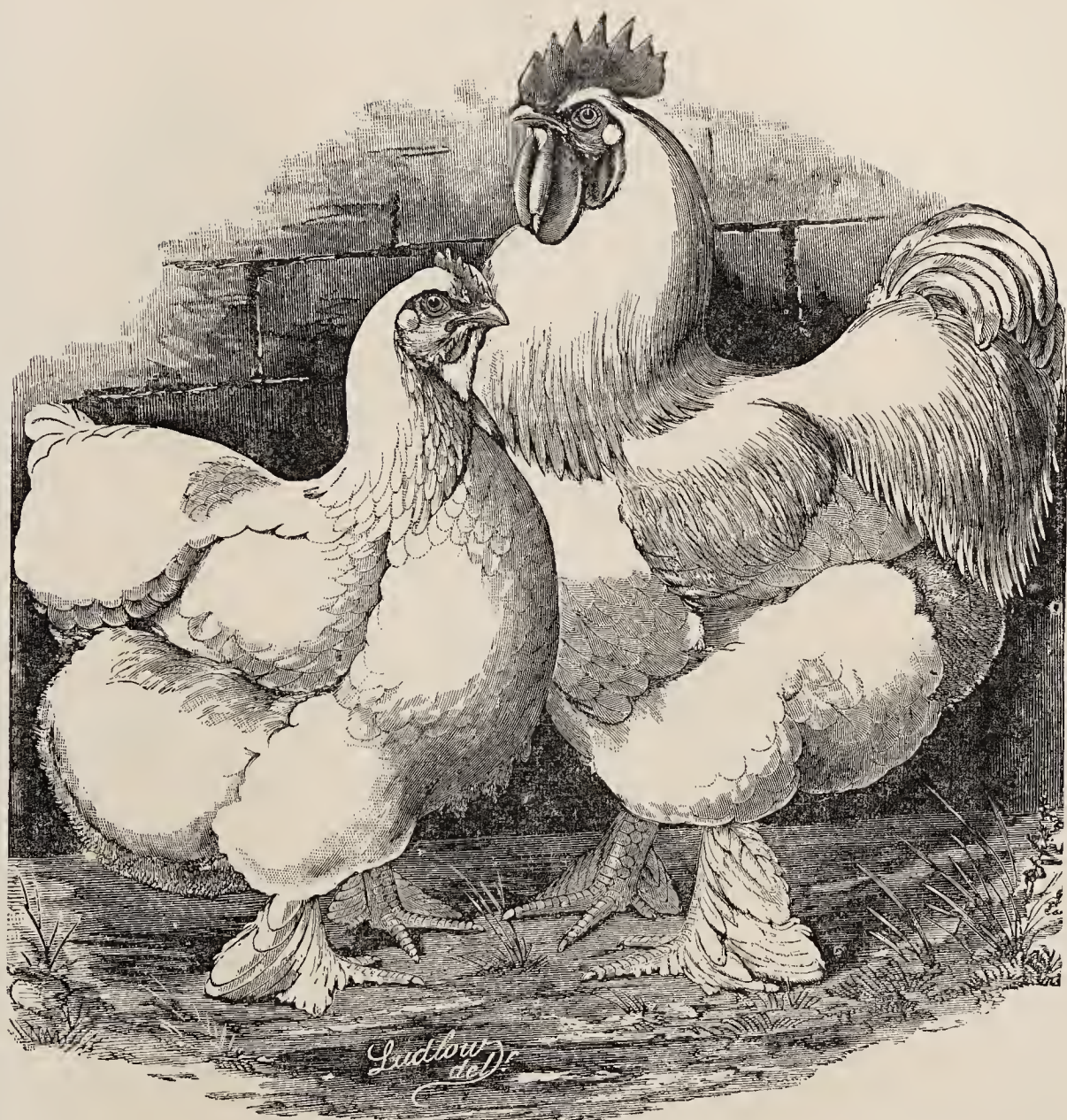
The Light and Dark Brahmas.

The Dark Brahmas are preferred by Mr. Doel, but the Light Brahmas are the choice of Mr. John Plummer. He says:—

"I tried twenty-eight varieties of fowls and ducks together, and out of the different varieties of fowls I selected the Light Brahmas. Living in the city, and having small yards or gardens, I required fowls that would not only be profitable, but that would stand confinement and not trouble my neighbours, and those qualities I found in the Light Brahmas.

"If I were in the country, or had a farm, I would cross them with the Games, which would make a hardier fowl, and one that would forage more for itself, while at the same time, it would be as good a layer and better for the table, though not quite so large.

"The White Brahmas are good setters as well as layers, and for those who wish to raise poultry extensively they are good fowls.



WHITE COCHINS.

"I would cross them with the Game for raising chickens. If the Dorkings are crossed with the Game, the result is a good fowl. Poultry-raising, if properly conducted, is a profitable business. The cross of the Light Brahma and the Game would suit our climate best."



LIGHT BRAHMAS.

Of the cross between the Brahma and Game, Mr. Wilson says:—

"The Brahma and Game make a good cross. The Game puts life into the Brahma. The Brahma is a dull fowl; it lays large eggs, but not many of them."

The quality which gives the Game fowl cross its merit in Mr. Plummer's eyes detracts from its value in the view of Mr. Doel, who says:—

"The objection to crossing the Game is, that it makes the fowls so pugnacious that you cannot keep many of them together; that is the only objection I have to the Game. The Game is a hardy fowl, but I don't think it imparts hardiness to the birds, or helps them to resist the climate."

Mr. James Anderson, who looks at the question of poultry-keeping as a farmer, says:—

"The Light Brahmas are the best, taken altogether. The White Leghorns are the best layers, but they won't sit at all. . . . But the Brahmas make the best mothers. I hatch all my duck-eggs, etc., with them. The Light Brahmas are the best poultry for this country. . . . The best breeder is the Brahma. A cross between a Brahma and a White Leghorn makes an excellent fowl, as the

Leghorns are the finest layers in the world. I have kept Game fowls also, but they are too pugnacious. Brahmas are the breed that are usually fattened for Christmas, because they are the heaviest; I have got them to weigh as high as eighteen pounds per pair dressed. The Brahma comes very early to maturity, and produces a large chicken; but I think the Dorking is the plumpest fowl for the table."

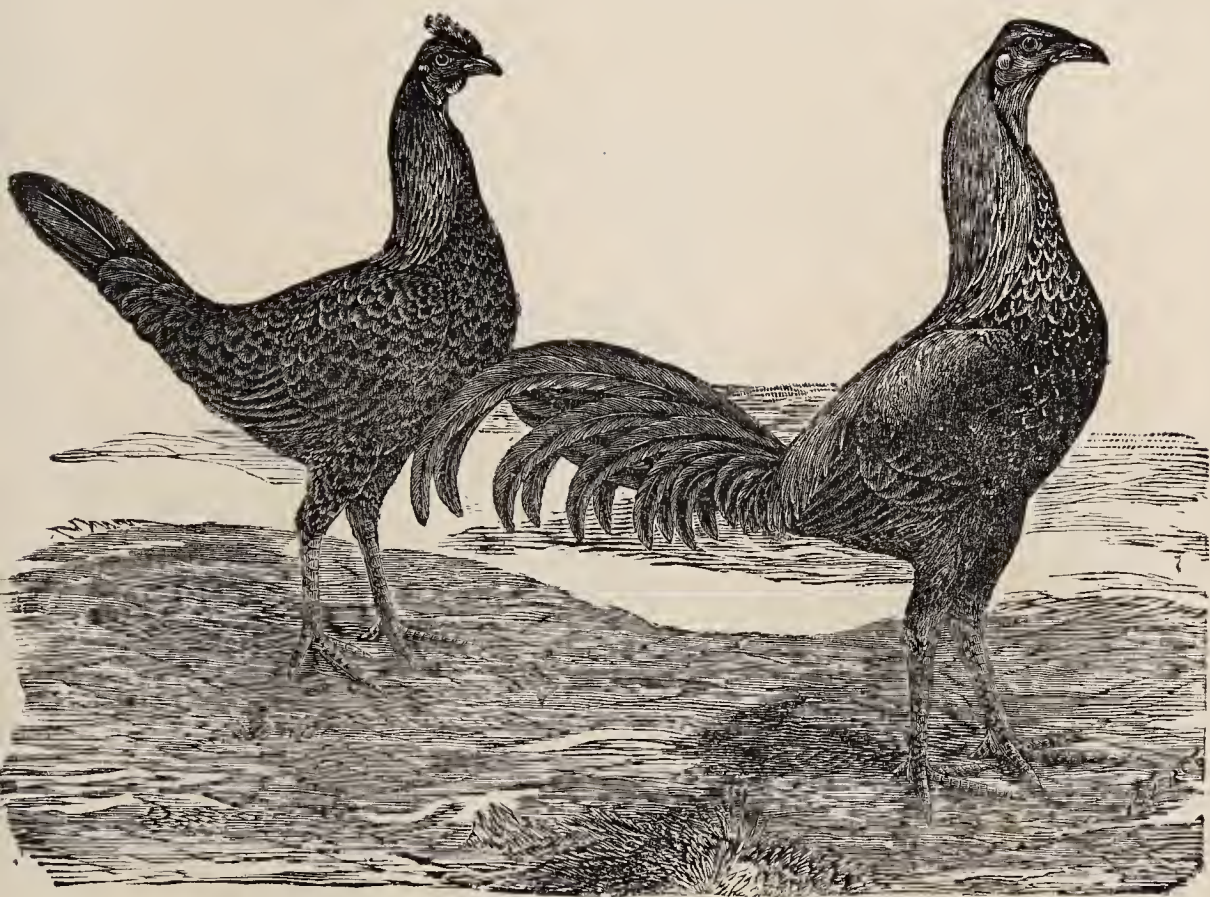
In answer to further questions, Mr. Anderson says:—

"I would advise the ordinary farmers of the Province to use the Dorkings or the Brahmas for the table, and Leghorns or Black Spanish for laying purposes; but the Brahmas are splendid layers during the winter, when you cannot get the Leghorns or the Black Spanish to lay. If you only feed the scraps to the Brahmas, and keep them in a moderately warm place, they will lay all winter.

"I use the Brahma hens alone for sitting purposes, because they are so much better mothers than any other breeds, and are so large that they will cover three or four more eggs than any other breed."



BROWN LEGHORNS.



GAME FOWLS.

The Houdans—Polands—Black Spanish.

"The Houdans, the Polands, and the Black Spanish fowls are not adapted for general use, because they are non-sitters and are not good table fowls. For general use, we must have a fowl that will sit as well as lay. The Houdan and other non-sitters, we find, lay a larger number of eggs than the fowls that sit, for one reason that their time is not taken up with sitting. Of sitting fowls, I suppose the Brahmas are the best layers we have. The Brahma, crossed upon the Black Spanish or the Poland, makes a very good fowl, preferable to a cross on the Hamburg, which I consider too small a fowl for general purposes. The flesh of non-sitting birds lacks the substance and flavour that we find in the flesh of sitting birds. The crosses of sitting birds with non-sitters are more inveterate sitters than even the full-bred sitting birds—a cross, for instance, of one of these Asiatics with the Black Spanish.

"I have experimented in crossing the different breeds, and have found that the best cross of a non-sitting bird and a sitting bird was the cross of the Brahma and the Spanish, but I prefer the Brahma and the Dorking."

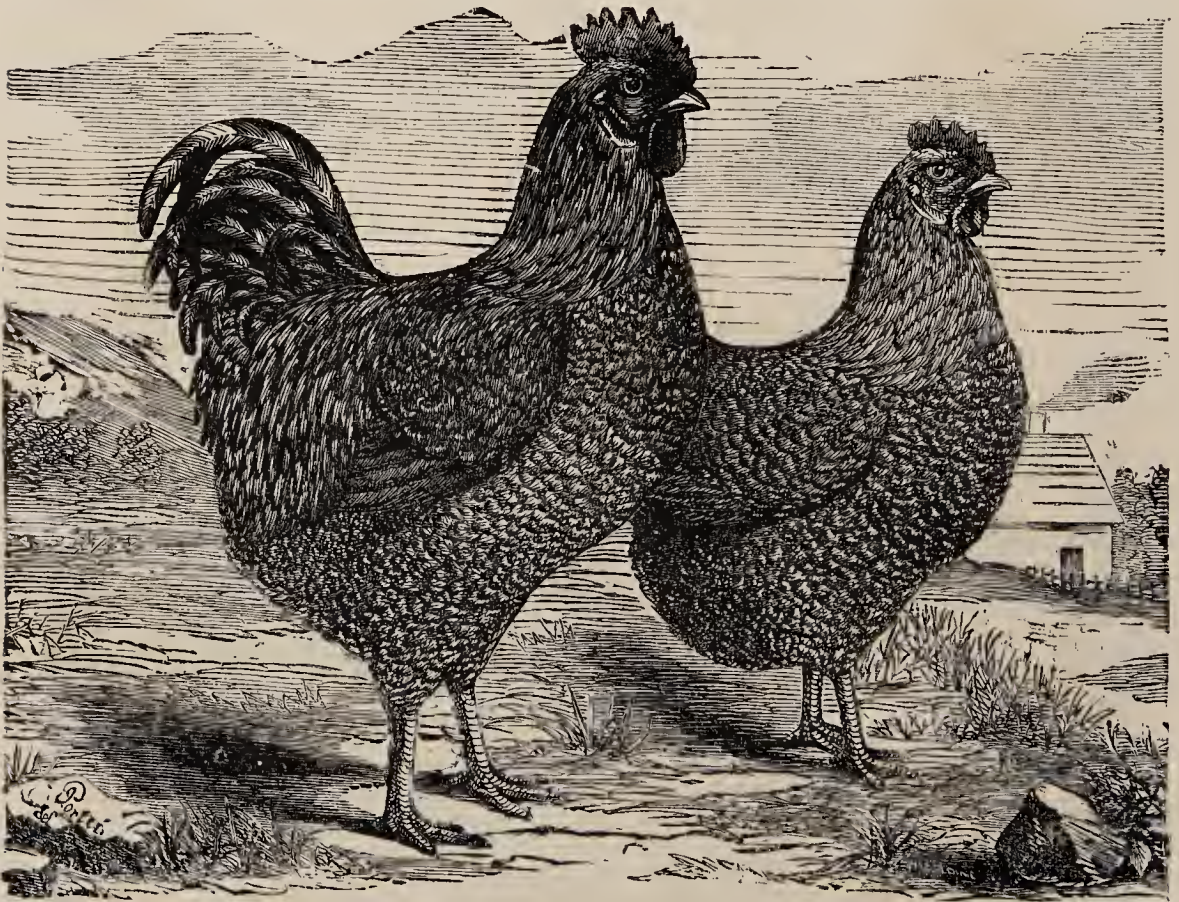


BLACK SPANISH.

The Plymouth Rocks.

The Plymouth Rocks are a new breed, their origin being rather a matter of dispute, but Mr. D. D. Wilson, of Seaforth, expresses the belief that they originated in a cross between a single-combed Dominique cock, and Black Java hens. Mr. Wilson says:—

“The Plymouth Rock is a good layer; it lays a large egg, with a strong, durable shell. It is a very good table fowl when it is no longer useful as a layer, and, when well cared for, comes very early to maturity.”



PLYMOUTH ROCKS.

Mr. Doel remarks of these birds:—

“The Plymouth Rock promises to be a very good fowl, but it will not suit the farmer for a number of years, as it can hardly be called a fixed breed yet. The farmer looks to have both a good fowl and a good-looking fowl. The Plymouth Rock has been a cross until late years, and it has not been bred sufficiently long or with sufficient care to make it yet an established breed, so that it may be depended upon. It will do very well to use for crossing purposes, like any other common fowl, because when fowls are once crossed, they are nothing but common fowls, although some of them make better layers than many full-bred fowls.”



DARK BRAHMAS.

The Cochins.

Mr. Doel dismisses the Cochin with the remark that "its flesh is too coarse and stringy to make it acceptable for the table." The Cochins too, as well as the Brahmas, take longer to come to perfection than the Dorkings, nor except that Mr. Wilson alludes to their eggs as being of a large size, does any other witness favour them.

A New Variety.

Mr. Doel mentions a new variety known as the Langshan. He says:—

"There is a breed of poultry said to be entirely distinct from any breed we have, and they are beginning to be bred very largely in England. I was going to breed them this year, and imported a trio for the purpose; but I am sorry to say that the two hens were stolen from me; I have retained the cock. It is a new Asiatic breed called the Langshan, said to have been brought originally from China by Major Croad of England. Those who have bred them say that they are equal to the Brahma or the Dorking. They are said to be nearly as early as the Dorking, and are much better layers than either the Brahma or the Dorking. They are not quite so large as the generality of the Asiatics, but I think they will attain to a larger size than the Dorking."

Is Poultry-keeping Profitable?

The opinion generally expressed as to the profits of poultry-keeping is favourable. Mr. Anderson says on this point:—

"I have not kept very close account of the profits of keeping poultry, but I have found it to be a very good investment. For instance, this year I bought a pair of Toulouse geese at the Poultry Association—prize geese—and they laid 45 eggs, from which I hatched 30 goslings, which I can sell at \$5 a pair if I keep them till the fall. That would be if I sold them for breeding purposes; but if I fattened them for market, I could get ten cents a pound for them, and they will weigh about 35 pounds a pair when they are fat. I have never sent any poultry to the foreign market; I don't think anyone in this part of the country has done so. There have been a good many eggs bought up here to be taken to New York."

Mr. John Plummer says:—

"I have got from \$5 to \$100 for live birds, but I was raising for fancy prices, and not for the market. I have raised cockerels to show at eight months old, weighing 9 pounds, and pullets $7\frac{1}{4}$ pounds. I have had no experience in the shipment of eggs to a foreign market.

"I have caponized fowls, and have raised Brahma capons weighing $16\frac{1}{4}$ pounds at one year old. That is a very profitable business to go into for the market, but very few understand it. I killed eight fowls before I succeeded with the operation.

"I think there is an increased quantity of poultry being raised, and a great many eggs are bought here for the American market. Farmers in this neighbourhood are going into it more than they used to."

Mr. Wilson says:—

"My opinion is that there is nothing that pays an ordinary farmer better

than to keep, incidentally, a limited number of fowls. I do not think it would pay any man to keep a very large quantity of fowls for the production of eggs, to be sold at 10 cents a dozen; but when a man has a farm of 100 acres, and keeps 50 or 60 fowls to consume a great deal of stuff about the farm, that would otherwise go to waste, he can obtain a large quantity of eggs at a very slight cost. Under such circumstances, I think there is no class of animals that pays better than a limited number of fowls. I think it is well, if possible, to combine both egg and meat producing qualities in a fowl."

In most situations, the farmer will find it expedient to keep fowls that will unite in themselves the quality of supplying a fair number of eggs with that of being a good table fowl. Where, however, the demand for eggs is the first consideration, the productive capacity of the fowls, both as to size and number, will have to be considered.

Mr. Wilson, of Seaforth, whose name has already been frequently mentioned, and who is sometimes known as "the Egg King of Canada," was visited by the Commissioners, who inspected his large establishment, and received his statement as to his mode of operations.

He has been engaged in the business for thirteen years; keeps eight or ten teams constantly employed collecting the eggs from the country storekeepers, and, after properly sorting and packing them, ships his stock to New York. In this trade he turns over seven and a half millions of eggs annually in barrels, each holding seventy dozen eggs. The lowest price paid last year was nine cents a dozen, and the highest fourteen cents, about ten cents being the average of the season. The collection is going on from March to the fall, the largest shipments being as the autumn months approach. As to the demand and the causes affecting it, Mr. Wilson says:—

"The demand for eggs in the New York market is practically unlimited. There is always a demand for a certain quantity, but if your supply exceeds that quantity, of course the price goes down, and as the price drops the consumption increases. During June, New York depends largely on Canada for its supply of eggs, while in January and February, before the hens begin to lay in the north, its supply comes from the south, and as the weather becomes hot, the supply from the south breaks off altogether.

"In the south the hens are prolific when ours are doing nothing, while ours are prolific when those in the south are doing nothing, and one reason why I clear out my stock in November is, that if I kept it, I would have to face the southern competition, which begins about the middle of December. The supplies from the south are very large. In the beginning of October, not only here, but all through the United States, the hens begin to moult, and consequently there is little or no egg production about December. I think hens, under the same circumstances, moult at pretty much the same period of the year."

The larger the eggs the better is the price obtained. With Great Britain the egg trade is small at present, Canadian eggs there coming into active competition with the French eggs. The cost of freight, however, is trifling, less than two cents a dozen, while about one cent per dozen will carry them—by the car load—to New York. In the event of a trade being opened with England, classification

of the eggs, in regard to size, would be necessary. When able to get it, the material used for packing the eggs is oat shells. The eggs, while in store, are mostly kept in a pickle the exact composition of which is a trade secret, but the main ingredient is lime. The effect is somewhat to thicken and harden the shells; the preservation of the contents is perfect. As the strength of the egg is of some importance, fowls should have access to sand and lime.

Incubators.

At present the use of the incubator in Canada has not extended to the ordinary practical operations of the farmer or poultry-keeper. Mr. Doel, who, on the whole, looks rather favourably on it, says:—

“An incubator could be watched and attended to very well by women and girls; if a farmer’s wife gave as much attention to the incubator as she now does to the dairy, she would reap more advantage. The incubator requires constant attention, and very few persons, unless they make it a special business, will give it proper attention. It is after the chickens are hatched that they require the most attention, because they have not their natural mother to attend to them, and to assist them in searching for their food, and to give them sufficient warmth when very young.

“I do not think as yet, however, it would be advisable for the farmers of the country generally to use the incubator. It might be used with advantage if one were established in a centre, in the charge of a person who made a special business of hatching for the surrounding farmers. They are using it in that way in England and in France. The people bring their eggs to the incubators, and in two or three days after they are hatched, they come and take away their chickens and the eggs that do not hatch. . . . I have no doubt if a person made a business of it, he could supply a very large city with half-grown chickens for the table, and make it pay very well.”

Healthiness of Poultry.

There does not seem to be any practical difficulty in the way of the poultry farmer in Ontario. A moderately warm house in winter is all that is necessary, with perhaps a little meat and some warm condiment as winter feed. The Asiatic species, Brahmas and Cochins, are said to be more delicate than others; but a moderate amount of care only will probably be required in their management, to avoid ordinary casualties in the winter season.

Mr. Doel, however, calls attention to a disease, similar to consumption in the human subject in its effects, and which he regards as requiring investigation. He says:—

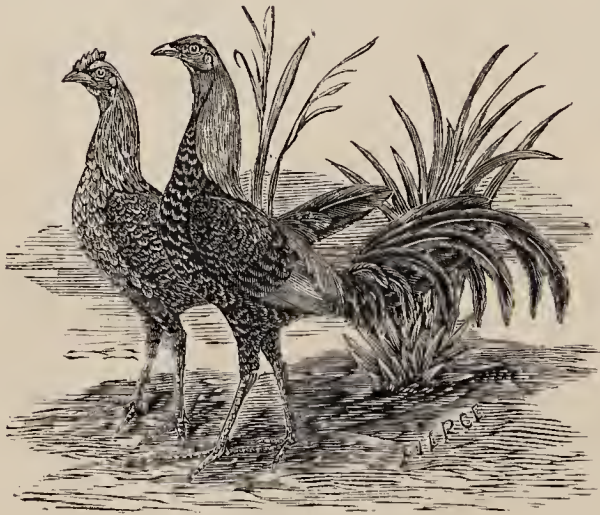
“It would be a great benefit to the country if we could get the members of the different Poultry Associations to combine for the purpose of doing something with regard to general diseases of poultry. The Ontario Poultry Association is assisted by Government. If the Board of the Association would consent to pay a person to examine diseased birds, it would be an excellent thing for the country, because there are many birds which die annually and nobody knows what is

the matter with them, and there are very few people who could learn by opening and examining a bird themselves. The difficulty is that we cannot induce any of the Associations to go to the expense of having birds examined scientifically."

It is not easy to say to whom should be delegated a duty an association of persons so immediately and directly interested is unwilling to assume. It would appear to be just one of those things that go to constitute the reason for the existence of such a body.

Mr. Doel also makes the following suggestion :—

"The various poultry exhibitions should be largely patronized by the public, as they are doing a great deal for the country. I would also strongly recommend that prizes be offered at the various leading exhibitions for 'Dead Poultry,' prepared ready for market, thereby encouraging farmers and others to prepare their poultry in some proper manner, to give them a nice appearance; for were they got up with some appearance and taste, much better prices would be obtained, and the public would willingly pay better prices; as it is, not one fowl in ten looks hardly fit for the table when offered for sale prepared (?) for market."



GAME BANTAMS.

CHAPTER XII.

SALT IN CONNECTION WITH AGRICULTURE.

So far as legislation is concerned, the manufacture of salt does not come within the scope of the authority under which the Commissioners have been acting, and, for obvious reasons, they have been extremely desirous in no case to travel beyond the limits of the powers confided to them or to interfere with interests with which they have had no legitimate concern. But salt enters so largely into the business of the agriculturist, either for dairying purposes or as a fertilizer of the soil, that it stands in a somewhat different position from other manufacturing industries.

In undertaking an inquiry into the uses of salt in connection with agriculture, the Commissioners had especially in view to ascertain, whether there were any obstacles to the use of the native product, and whether, if such existed, they originated in any inherent defect or inferiority in point of quality, or in causes that were within the control of the manufacturer.

The subject was brought very prominently to their notice by a member of the Commission—Mr. Richard Gibson—who, as already mentioned, visited Great Britain in the course of last summer. When at Liverpool, Mr. Gibson inspected the establishment of some dealers doing a considerable business in American and Canadian products. Pointing to a quantity of butter in the warehouse, one of the partners remarked “You must use fine English salt. Your American and Canadian will not do if you wish a share of this trade.” It may be remarked that the speaker was not an Englishman, but an American, and therefore was not likely to be possessed with any English prejudices in favour of English salt.

It is never pleasant to give public utterance to unpalatable facts, especially when, by so doing, large interests may, presumably, be injuriously affected, but, after all, the plain outspoken truth is in the end most to the advantage of everybody, and in no case has that axiom proved more true than in the instance referred to.

In the first place, it raised the question in the minds of the Commissioners, whether Canadian butter was prejudiced by Canadian salt being used in its manufacture; and, in the next, it suggested to them that, if an injustice were being done to a great Canadian industry, they would not incur censure or blame

even if they travelled a little beyond the limits of their programme in order to ascertain how such a prejudice could be removed.

Nor was this the only reason why such an investigation was desirable. A communication was received by the Commissioners from Messrs. Wm. Davies & Co., of Toronto, in which it was alleged that their firm, the largest porkpackers probably in Canada, and already mentioned in connection with the trade in hogs, had been compelled to relinquish the use of Canadian salt in consequence of a sliminess appearing upon the bacon which they had shipped to Europe.

It was also well known that, in the minds of some leading cheese manufacturers of western Ontario, an opinion existed unfavourable to the use of Canadian salt in the manufacture of cheese. Mr. Ballantyne, M.P.P., one of the Commissioners, had made in 1876 and 1877, a great many experiments with the Huron salt and the English factory-filled salt; he had used Higgins' brand of the English salt in a trial with the native article, and after several tests, made at different times, but under equal conditions in every respect, the result was decidedly in favour of English salt. Under these circumstances the Commissioners decided that some of their number should visit the Huron salt manufacturing district, and there invite the attendance, not only of salt manufacturers but of other persons in Huron or the surrounding counties by whom Canadian salt was likely to have been used in connection either with cheese or butter making, as well as farmers who had applied it as a manurial agent.

In addition to this arrangement every opportunity was taken at other meetings to ascertain the views of witnesses as to the value or quality of Canadian salt in connection with the several branches and departments of agriculture already mentioned.

The Commissioners are glad to be able to state that the result of these inquiries has been eminently satisfactory. They have no hesitation in giving it as their unqualified opinion, that Canadian salt is not only equal to but even exceeds in purity the best English brands; and that there is no reason whatever, either on the ground of quality or cost, why the imported article should be used in preference to the native product by the Ontario farmer or dairyman.

So far as the use of salt for manure is concerned, it has hardly been suggested that any practical difference could possibly exist between Canadian and English salt, although, in one instance, a witness,—Mr. Middleton, of Clarke township (Durham),—stated, that he and his neighbours had come to the conclusion that Goderich salt was not "so strong" as the English article, and that they could not see the same effect from it on the crops. He admitted at the same time that the season might have had something to do with the difference.

As an experiment, Mr. Middleton's trial, of course, would be worthless, unless all the surrounding circumstances were taken into account, but, as a matter of fact, it is next to impossible that there can be any real difference between Canadian salt and English salt applied in this manner. To disabuse the mind of any

one, however, who may have formed such an opinion, it may be worth while to remark that, as between the two salts, while out of 100 pounds of ordinary Canadian salt applied to the land there would be $98\frac{3}{4}$ lbs. of chloride of sodium or pure salt, there would be only $97\frac{1}{2}$ to 98 lbs. of pure salt from 100 lbs. of ordinary English salt, the difference in either case being made up by moisture or some foreign ingredients; and, unless it is to be argued that the infinitesimal additional quantity of the impurities found in English salt is to make any difference at all favourable to its effects on the soil, it must be clear to the simplest comprehension that one salt is as good as the other, or, if there be any advantage, it is on the side of the Canadian. The question of the use of salt as a fertilizer will be further noticed in due course.

Purity of Canadian Salt.

So long ago as January 23rd, 1872, Dr. Sterry Hunt may be said to have settled all doubts as to the general purity of Canadian salt. His analysis gives to Canadian salt 97.730 of chloride of sodium or pure salt; .050 of chloride of magnesium; traces only of chloride of calcium; .932 in one case, 1.020 in another of sulphate of lime (gypsum); and from 1.200 to 1.500 of moisture. An analysis subsequently made at the instance of persons interested in the trade, was put in as evidence during the late inquiry, showing that Canadian salt is more pure, not merely than the Onondaga or American salt, but also than the highest and most famous English brands.

	COLEMAN & GOUINLOCK'S PURE DAIRY SALT, BY PROF. ELLIS.	RANSFORD'S SALT, BY PROF. CROFT.	HIGGINS' EUREKA SALT, BY DR. MOTT.	ASHTON'S. SALT, BY PROF. WEBER.	ONONDAGA SALT, BY PROF. WEBER.
Sodic Chloride, or Common Salt	98.739	98.120	97.820	97.562	97.415
Water .....	.328	.500	.480	.927	1.009
Calcic Sulphate	1.156	1.300	1.482	1.315	1.300
Calcic Chloride .....				.142	.102
Sodic Sulphate		Trace.	.097		
Magnesia Sulphate		Trace.	.122	.112	.081
Magnesia Chloride .....	.016	.080	.025	.042	.063
Insoluble Matter .....	.017				
	100.256	100.000	100.026	100.000	99.970

Mr. Gray, of the firm of Gray, Young & Sparling, of Blyth and Seaforth, referring to the incontestible purity of Canadian salt, said:—

“I have been engaged in the manufacture of salt for ten years. We make mostly fine and coarse salt, and our market is principally in Ontario and the United States. The most tangible evidence that I can give with reference to the quality of Canadian salt is, that, wherever it has gone, it has always taken the lead. We have exhibited it in Philadelphia, Sydney and Paris, and at each of these places, where the awards were made after analysis, the Canadian salt received the highest award against all other nations.” (The witness exhibited medals which the firm had been awarded at each of those exhibitions.)

Nor is testimony of this class confined to the salt districts of Huron and Bruce. At the Elarton salt works, owned by Mr. C. J. Kingstone, at Warwick, in the County of Lambton, from a bed of salt supposed to be 60 feet in thickness, and 1,200 feet in depth, yielding brine at a depth of 1,400 feet, salt has been manufactured that took the silver medal and diploma at the Paris Exposition of 1876, besides carrying off prizes at Dominion and local exhibitions in this country.

At the same time it was admitted by manufacturers examined by the Commissioners, that imperfections in the production of the salt might occasionally have had something to do with the complaints which had been made. Mr. Rightmeyer, of Kincardine, who manufactures a very superior quality of salt, and ships some 8,000 tons annually to the United States, besides selling from 2,000 to 3,000 tons in Canada, says :—

“When our works first started, and before a reservoir was formed in the salt beds, affording means of settling the brine, there was found the presence of gypsum in the salt, though not to any considerable amount.”

Since this difficulty was overcome, Mr. Rightmeyer has had no complaints, and finds his salt in demand by packers in the United States, who will use no other.

Porkpackers' Complaints.

Dr. Coleman, of the firm of Coleman & Gouinlock, of Seaforth, very frankly admitted that complaints had been made by porkpackers, and explained what he considered to be the cause. His statement was as follows :—

“Complaints have been made in Canada of a kind of briny scum which our curing salt is said to produce on the meat, but I do not think it injures it; I think I can account for this. The meat men in Canada do not deal fairly with us. Salt is made summer and winter; summer-made salt loses its moisture, while winter-made salt retains much of it, and as these men order most during the winter, we are obliged to give them winter-made salt, which is generally frozen, and which, when it comes into contact with the meat affects it in the way stated. If we went to the expense of drying the salt in stoves, as they do in England, this difficulty could be remedied; but if the packers would give us their orders in good time we could supply them with summer salt, so that the difficulty would not occur. My theory is that the slime is caused by the salt curdling the albuminous portion of the serum in the meat. Frozen salt dissolves rapidly on meat. The exterior portion is cured rapidly, and the inner portion is left uncured, which does not happen with dry salt, for the reason that the serum flows slowly from the meat; but with wet salt flows rapidly from the surface, hardening it and preventing the flow from the inner portion. I supplied salt to Davies, of Toronto, but he gave it up on account of the sliminess. The evil comes from the meat, not from the salt; there is a good deal, however, in prejudice. It is our business, as dealers and producers, to endeavour to meet the market; we have good results with our salt here at home, and we should have the same in other parts of the Dominion. We send very little coarse salt in winter to Buffalo; it all goes by rail; we take special care that it is dry. Cowan, of Toronto, has not dealt with us, but R. Thompson has.”

Mr. Samuel Platt, the pioneer of the salt industry in Canada, who was also examined, expressed the opinion that the sliminess on pork could easily be accounted for. All salt, in the fresh—or as he terms it, “green”—state, contains a certain amount of water, which even evaporation does not entirely eliminate. Only time renders it thoroughly dry and fit for packing purposes. The English salt crossing the Atlantic, and being stored for a considerable period in bulk at its destination, in Montreal or elsewhere, becomes perfectly dry by this natural process, and, if Canadian packers desire to avoid the danger of which Mr. Davies complains, they have only to order their salt in time, to insist on being supplied with a well-dried article, and to use it when it is fully and properly matured.

Mr. M. P. Hayes, another witness, who was for some time engaged in the manufacture of salt, and now retains a scientific interest in all that relates thereto, also favoured the Commissioners with his evidence. He says :—

“There can be no doubt that the salt produced in Canada for curing purposes, is not only perfectly pure, but in one sense even better than the English salt. The English salt, however, owing to coal instead of wood being used in the process of evaporation, is manufactured in deeper pans than are used in Canada, and the result is the crystals are of a harder and more solid nature, so that, although the Canadian salt is better adapted for curing than the English, the latter is, on the whole, to a certain extent preferable for packing purposes.”

The sliminess, Mr. Hayes is inclined to attribute rather to dampness in the cellar than in the salt itself. He says :—

“There is a distinction between packing and curing ; for curing in summer our salt is superior, but for packing, a firm, hard, crystalized salt is required, one that yields very slowly to the surrounding atmospheric conditions, and for that reason Liverpool salt, which is made at a low temperature in deep pans, and has a hard solid crystal, is unquestionably superior to ours for packing purposes, but the preparation of our salt is in our own hands. By a slower mode of evaporation we can make our salt as dry and firm as the English salt, while it would have an advantage in being superior in quality. The same difficulty as to the want of dryness is found in England in the salt sold there for home use. The impurities in the salt are so trifling as to amount to nothing ; everything depends upon the formation of the salt ; for ordinary domestic purposes Canadian salt is as good as any ; for curing purposes it is entirely superior to any salt in the world : this is admitted by all the best packers in the United States.”

Mr. Rightmeyer, already referred to as manufacturing a remarkably fine description of salt, chiefly for the American market, says :—“The porkpackers in Kincardine who formerly used English salt, now use mine exclusively ; their meats command best prices in Toronto or other markets.”

Mr. Robertson, of Seaforth, who, in 1866 and 1867, was engaged in the pork-packing business, stated that he had used Canadian salt exclusively, that it gave him perfect satisfaction, and that he had no reason to doubt its purity or suitability to his business ; he never used any but Canadian salt in the curing process. Mr. Robb, who is also engaged at Seaforth in the pork-packing business, has used Seaforth salt since he commenced, and “has never had any complaints of the

meat cured with it." It is, however, apparent that he was not altogether unacquainted with the tendency in the meat at times to get a "little slimy." He remarks:—

"The slime on the meat does not affect it permanently, but unless it is rubbed off and the meat salted anew, the meat will be spoiled altogether."

Now, it is just this process of "rubbing the slime off the meat," and re-salting it, that English purchasers would decidedly object to, if it were often repeated, but there is no reason to doubt that in Mr. Robb's case, as possibly in that of Mr. Davies, when this difficulty arose the salt had been used in too fresh, or "green" a condition.

Mr. John Beattie, now Mayor of Seaforth, was engaged in pork-packing in the years 1878 and 1879, during which time he used Canadian salt exclusively. He had heard rumours unfavourable to Canadian salt, but said he did not believe that any man could tell the difference between Canadian salt and English salt, provided, of course, that care were taken to secure a properly manufactured article. He lays great emphasis, however, on the necessity of the salt being dried. He says:—

"It must be dried; all the water must be out of it," and he goes on to say, "Once, when I got some green salt, it had a slimy effect on the meat, and it was necessary to wash the meat and salt it over again."

This statement further justifies the supposition that Messrs. Davies & Co. had legitimate cause of complaint, while, at the same time, it is satisfactory to know that the true cause has been discovered, that it arises from no inherent defects in the Canadian salt, and that very little care in the manufacture and arrangements between the buyer and seller, for the salt to be allowed a sufficient time to become perfectly dry, will suffice to prevent the possibility of any just cause of complaint arising in the future.

Dr. Coleman put in letters from a large number of well-known firms in the United States and Canada, by whom Canadian salt is used for pork-packing purposes to the exclusion of all other salt, some of them having a reputation which would be a sufficient guarantee against the use, on their part, of any article that was not of first-class quality.

Canadian Salt in Cheese Making.

The alleged objection to the use of Canadian salt in the manufacture of Canadian cheese has been alluded to, and does not appear to be any more fatal to the Canadian product than that which has just been noticed, although it is impossible to doubt that there was a time when, for reasons already hinted at, Canadian salt might have been regarded in a less favourable light by the Canadian cheese manufacturer than it is to-day. In 1877, Mr. Ballantyne, who, as already mentioned, had made a series of experiments with Canadian and English salt in his own cheese factory read the results of those experiments to the dairymen in con-

vention. Unwilling as Mr. Ballantyne was to injure any Canadian interest, his first duty was obviously to that particular branch of industry, of which he is so prominent a member, and the result of the statement he then made was to prevent, to a very large extent, the use of Canadian salt in the Ontario cheese factories.

The risk incurred by the cheese manufacturer in using any article on which he cannot absolutely rely, is very great, and no difference in price, even if it were much greater than that which exists between Canadian and English salt, would make it worth while for any manager of a cheese factory to imperil his reputation by using any other than the best established and most reliable article. English salt, represented particularly by Ashton's and Higgins' brands, has a world-wide and long established reputation, and in using those brands every manufacturer feels confident that, so far as the salt is concerned, he will be placed in no peril of failure or loss. But it should be, and it may be hoped now is, the determination of the Canadian salt manufacturer, by sheer superiority in the article he turns out, to overcome this difficulty and make for his product a reputation equal, if not superior to those of his English competitors.

He has the more need to do this because, undoubtedly, agents for the English salt manufacturers have, at various times, circulated statements unfavourable to Canadian salt; and as these gentlemen are sometimes buyers of Canadian butter and cheese, they have a considerable influence with the dairymen of Ontario.

In order to test fairly the respective merits of English and Canadian salt, Mr. Ballantyne, M.P.P., and Professor Arnold—then in Ontario—instituted a rigid examination into the quality of several cheeses submitted to their inspection at the Kinburn (County of Huron) manufactory, on the 26th of October, 1879.

The character of the investigation was described by Mr. John R. Murray, manager of the Kinburn factory. His statement was as follows:—

"I have manufactured cheese at Kinburn for the last eight years. I remember Professor Arnold visiting the Kinburn factory on the 22nd of August last year, and making a test of cheeses made with different kinds of salt. The kinds we used were, the Stapleton Patent Canadian Salt, Coleman & Gouinlock's Dairy Salt, Coleman & Gouinlock's Common Salt, and the Higgins English Eureka Salt. We made seven and a half cheeses and kept track of seven, so that I was able to say what kind of salt was used in each cheese. I branded them with letters known only to myself. The cheeses were then submitted to Professor Arnold and Mr. Ballantyne, and they examined them, I think, on the 26th of October. After an examination of over an hour, they finally decided that the cheese made with the Stapleton salt was the best; they said the cheese made with the English salt was not so good, but nearly as good, and Professor Arnold said that the cheese made with Coleman & Gouinlock's salt left a little taint in his mouth, but that age might take it away. I then told them the brands, and I afterwards branded the cheeses over again by changing the letters on them so that no one would know them afterwards. I also changed them about in the racks, because I thought Professor Arnold and Mr. Ballantyne might come back again and know the order in which they had left them."

It will be observed that Canadian salt of the Stapleton brand took the lead on this occasion, and although it was not pretended that any very perceptible difference existed between that and the English salt, the judgment of these experts was, on the whole, in favour of the Canadian article.

The sequel of this examination appears to the Commissioners, although at first sight it might seem to challenge the judgment of Messrs. Ballantyne and Arnold, to give additional force to their verdict in favour of Canadian salt.

The several cheeses were sent, marked with new brands, so that they might not be identified, to the Dairymen's Convention held in the February following. On that occasion the cheese made with Coleman & Gouinlock's Canadian salt was graded as No. 1; the one made with the Stapleton salt came next; then another made with Coleman & Gouinlock's coarse salt; while the cheese made with the English salt was last in the field: so that, on two separate occasions, the best judges who could be found pronounced in favour of Canadian salt made cheese as against that made with the English salt. The time that had elapsed between the two tests might very easily account for that infinitesimally slight difference which caused the variation from the original judgment, a difference which, it may safely be assumed, none but the most critical experts could possibly detect so far as the merchantable properties of the respective cheeses were concerned. It is probable that there was really no difference practically affecting their value.

Mr. Ballantyne's statement, at Seaforth, where he was assisting as a member of the Commission in this inquiry, and tendered himself as a witness, was:—

"What is needed here is to establish confidence in Canadian salt, and then it will be used. *I have no doubt as to its good inherent qualities.*" He went on to say, "I prefer coarser salt for cheese-making. Cheese seems to ripen better as the cheese gets old; the most careful cheese-makers, such as Mr. Murray and Mr. McAdam, prefer Ashton's salt on account of its being coarser than Higgins'."

As a matter of fact, Canadian salt is now being used in a very large proportion of the cheese factories in western Ontario.

Mr. Peter J. Daly, dairyman, in the County of Hastings, where some advantages exist in favour of English salt, owing to the freight being lower from Montreal than from Huron, is in the habit of using Huron salt. He says:—

"Huron salt is used in the cheese factory of which I am President, but I do not know what particular brand it is. I have no reason to think it is otherwise than satisfactory, and the buyers find no fault, though they are both interested in English salt."

Canadian Salt in Butter Making.

No valid ground for the insinuation to the disparagement of Canadian salt used in the manufacture of butter, referred to by Mr. Gibson in his report, has been discovered by the Commissioners.

While sitting at Perth, in the County of Lanark, Mr. Robert Meighan, a

large purchaser of butter and other produce in that town, already alluded to in a previous connection, expressed a very decided preference for English salt, selecting Higgins' brand above all others, and the salt which Mr. Meighan recommends is the salt which is likely to be most used by a very large proportion of the dairy farmers in his district. He stated that, since they commenced to use Higgins' "Eureka," they had few complaints; previously, the complaints were numerous, and the inference sought to be established was, that the salt complained of was of Canadian manufacture. This, however, was by no means clearly made out, and Mr. Meighan admitted he could not say the salt complained of was Canadian, nor did he know positively that any of the complaints arose from the use of Canadian salt. On the other hand, witnesses are numerous to the satisfactory character of Canadian salt used in connection with the manufacture of butter.

Mr. Inglis, of Chicago, formerly of Teeswater, and who, as already mentioned, established the first creamery in the County of Bruce, spoke in the highest terms of Canadian salt. During the time that he was managing the creamery, Mr. Inglis tried both English and Canadian salt. He admits that he did not find much difference, but says that the butter that took the highest price was made with Canadian salt, and he therefore stopped using the English article. Even now, while resident in Chicago, he continues to use the Canadian salt, which, he says, he is confident is equal to any English salt in the manufacture of butter.

Mr. Robertson, of Seaforth, who is a buyer of butter from the farmers in that neighbourhood, says that Canadian salt is in general use, that some farmers, at his request, tried English salt, but that it made no difference whatever in the butter.

Mr. Edward Cash, another large purchaser of butter in the same district, has never observed any difference in the quality of butter from the use of any particular kind of salt. Previous to the discovery of salt in the County of Huron, American salt was largely used. The butter-makers now all but universally use Canadian salt.

Mr. Hettle, who succeeded Mr. Inglis in the management of the Teeswater butter and cheese factory, gives testimony similar in effect to that gentleman. He says :—

"We have never had any fault found with the butter. We have generally used Seaforth salt, both for butter and cheese. Where the Liverpool salt and the Canadian salt have been used for the same shipments no difference whatever could be found on examination. No buyer has ever complained to us of the salt used. We are just now using Liverpool salt, but I cannot discover any difference from the Canadian salt."

From the facts before them, the Commissioners can have no hesitation in stating that the well-ascertained chemical purity of Canadian salt, when properly manufactured and the proper brands are used, is fully equalled by its adaptability to all dairying purposes.

Salt as a Fertilizer.

The use of salt for fertilizing purposes is a comparatively new feature in Canadian agriculture, although it has long been employed by agriculturists in Great Britain.

In the year 1868 the Royal Agricultural Society of England offered a prize of £100 for the best essay on the use of salt as a fertilizer, and the essay which took the prize recommended the following quantities:—

Description of crops.	Pounds of salt per acre.		
	Light soil.	Heavy soil.	Heavy loam.
Wheat.....	500	450	400
Rye.....	550	500	400
Barley.....	600	550	450
Oats.....	650	600	500
Peas.....	600	550	400
Hops.....	600	500	400
Potatoes.....	600	400	350
Turnips or beets.....	500	400	300
Clover and grasses.....	700	600	450
Hay, 20 pounds per ton.			

Fruit trees, four pounds, in trenches on each side of tree.

Mr. Richard Ransford who is familiar as an Englishman with the use of salt in Great Britain for fertilizing purposes, is now carrying on the business of a salt manufacturer at the Stapleton works near Clinton, in the County of Huron. As a practical chemist he was able to explain what, in his opinion, was the precise effect of salt when used upon land. He said, as a chemist and coming from England where salt is used so largely:—

"I always took it for granted that it was beneficial as a fertilizer. Salt acts in several ways on the land. It acts largely as a solvent, dissolving the ingredients of the soil, much more rapidly and effectually than pure water. It retains the ammonia in the manure for the use of the plant instead of letting it evaporate, and it attracts moisture from the air and gives it to the soil."

He went on to remark that a certain amount of salt enters into the composition of all plants, which renders it necessary to their health that they should be supplied with it either from the atmosphere or by artificial means, and he expressed the opinion that the geographical and climatic condition of this country, far removed as we are from the ocean, make it necessary that salt should be used here even more freely than in England.

He does not of course pretend to say that salt alone is sufficient to recuperate the exhaustion of the soil, or even to maintain fertility. Salt is not so much a fertilizer as an agent or factor in the work of fertilization, while there is good reason to suppose that a certain portion is absorbed into the body of the plant.

The writer of a letter put in by Mr. Moore, one of the witnesses, Mr. J. H.

Baulch, of Hampton, states in effect that, where salt is freely used on grain crops it can be traced in the straw fed to cattle in the winter season, so that they take it much better than straw grown where salt has not been applied.

Prof. Bell, of Albert College, Belleville, who gave evidence before the Commissioners during their sitting at the latter place, gave the following as his theory regarding the operations of the salt upon crops :—

“I think salt (chloride of sodium) might be applied advantageously upon land remote from saline waters. The chlorine would combine with the atmospheric moisture and form hydrochloric acid, and this acid would seize upon some other ingredients of the soil, while the soda would be liberated, and act on the silica of the soil and make it soluble. It is in this way that salt has an effect in strengthening and brightening the straw of the grain.”

At all events the evidence is overwhelming that, probably in the manner described by Mr. Ransford and Prof. Bell, salt has a powerful and beneficial effect upon certain crops.

Mr. Thomas Govenlock, of Seaforth, stated that his firm had, in three months during the then current year, sold 63,000 tons of salt for fertilizing purposes. The witness himself is a large farmer, and, as his evidence referred to in another part of the Report shows, a feeder and shipper of cattle. His practice is to use from four to five hundred pounds of salt to the acre every year. He has used it on turnips, on wheat and barley, and on grass crops. His statement is that it hastens the crop, increases the yield, makes the turnips more vigorous, and adds strength to the stalk of the grain.

Mr. Ransford, already mentioned, applies it to pasture lands, roots and grain. When used on the hay it is scattered lightly by hand in the spring. In common with other witnesses he alleges that it adds greatly to the strength of the straw in the growing grain, a very important circumstance in connection with some of the complaints of the weakening of the straw of spring wheat.

One of the first witnesses who referred to this subject when under examination was Mr. John Gibson, of the Township of Markham, who spoke in the most confident terms as to the effect of salt on the straw of spring wheat. He is also of opinion that salt has the effect of diminishing the danger of rust. He says :—

“I think salt is beneficial, even where land is not underdrained. I sowed it on spring wheat on the Scarboro’ farm, and I am able to tell, by the appearance of the grain, where the salt has been sown and where it has not ; where the salt is sown, the grain is brighter and clearer, and the wheat riper than where it is not sown ; and I am quite satisfied that since I have sown the salt on the fall wheat, it has a better and finer straw, and the grain comes to maturity more quickly.”

Mr. Sproatt, a large farmer in the Township of Tuckersmith, has made numerous experiments with salt, which he has been using for ten years. He says:—

“I generally use from 400 to 500 pounds of salt to the acre. I think it has the effect of creating moisture about the roots of turnips. I had a potato patch beside the turnips, but I did not sow any salt on it, and you could see a distinct line showing where the salt was sown and where it was not. The salt had also the effect of bringing the turnips ahead rapidly, and thus enabling them better to resist the fly. I could not say whether or not it benefited the turnips in point of size. It made the tops more vigorous. The effect on the barley was to strengthen the stalk and double the yield.

“The year after the salt was sown on the turnips, the barley crop, which followed the turnips, yielded sixty bushels to the acre, that is ten or twelve bushels to the acre more than before. The barley also showed an increase in weight; some that I weighed went fifty pounds to the bushel. I buy the salt at Seaforth.”

Mr. John Moore, of North Dumfries, in the County of Waterloo, who was one of the witnesses examined during the sittings of the Commissioners at Galt, has recently substituted salt for gypsum, which he had been using for many years, and has found the change advantageous. He has applied salt to his turnip crop with benefit, and it is important to notice that its effects appeared to be maintained upon his crop of barley, which followed the crop of turnips. The barley, he says, ripened sooner, the sample was brighter, the straw stood up better, and, so far as appearances went, he thinks he had double the yield. The salt had been applied in the very moderate quantity of 100 pounds to the acre. It may be fairly open to question whether the salt alone produced the benefit on the barley to so great an extent as Mr. Moore attributes to it, but it appears to be quite certain that, previous to the application of salt, barley-growing had been unsuccessful on Mr. Moore's farm, and that, after the application of the salt, he obtained a fair average crop.

He has also tried the experiment of using salt on a strip of land adjacent to other portions to which no salt was applied; the effect, he says, of the salt was that the crop (of turnips) was better all through the season. The use of salt he states is becoming very general in his locality. It is hardly necessary to say that, in common with all other good farmers, he uses salt very largely in feeding his cattle.

Mr. Thomas E. Hays, Reeve of McKillop, and ex-Warden of the County of Huron, was a witness examined at Seaforth. His testimony was very similar to that of some of the other witnesses. He uses salt more liberally than Mr. Moore, the result no doubt of his farm being situated so near to the works, that he is able to obtain it without the cost of freight added to the original charge. He also states that not only has the straw been stiffer in consequence of the application of salt, but, that the ear of his wheat, both spring and fall, was better filled, and he had scarcely been troubled with any rust in the fall wheat where salt had been

applied. By the application of salt to the turnips he was also, he says, able to get them thinned a week earlier than previously.

The importance of hastening on the growth of the turnip, or causing its early and vigorous development, as a means of frustrating the ravages of the fly, will be well understood by all turnip growers.

Mr. Thomson, of Brooklin, a very observant and careful farmer thinks that the salt is beneficial to the land not so much as a fertilizer, as a fertilizing agent, and while he agrees with others that it produces stiffness in the straw, he adds that it has the effect of absorbing the moisture from the atmosphere, and keeping the land moist in dry seasons. He applies it very liberally mixed with droppings from the hen coop. He uses Goderich salt, which can be delivered in Brooklin at \$6 a ton.

Mr. Walter Riddell, of Coburg, has noticed the very decided effects of salt on root crops, both as regards the tops and the roots. He says: "I have experimented very carefully with salt and am quite convinced of its beneficial effects on mangolds and Swedish turnips."

Mr. Richard Rennelson, of North Dumfries, at Galt went rather minutely into his experiments with salt. His statement is of sufficient interest to justify its reproduction at length. He says:—

"I have used salt some three or four years. I have tried it on mostly all crops. In our barley field this season, there had been a crop of wheat the year previous. This field was ploughed in the fall by three horses—deep ploughed—and manured during the winter; about eight good waggon loads of manure to the acre were applied to it; and in the spring we sowed our salt before touching the land, about 200 pounds to the acre. This was harrowed and gang-ploughed in; but across the field, taking a fair average of the soil, I left unsalted a strip six yards wide. On about fifty yards length of this unsalted part, however, I put the manure doubly thick, and when it came near harvest time the difference was very marked.

"Some of my neighbours saw the barley, and it was the universal opinion that the unsalted part would not yield more than one-half what the other did, partly because it was broken down and did not ripen. The part that received the double share of manure was much better, in fact nearly as good as the salted, but considerably broken down. I passed over the field yesterday, and the stubble on the salted part is quite bright, and you can see without difficulty, clear across the field, the difference between it and the stubble on the unsalted part, which is weak and dark. What was unsalted got the same amount of manure, except the part of it that got the double quantity. There is very little difference between the salted and the unsalted portions in respect of the clover catch, except that the doubly manured part is decidedly best.

"I have cut the crop. There is a decided difference in the head of the barley. The quality of the barley on the salted ground is decidedly better than

the other—better filled and better coloured. The straw was quite weak on the unsalted part, but it was the fly that was the cause in part of its breaking down. The fly seemed to seize on the unsalted part, while the other stood up. The salted part was also affected by the fly, but it stood up a week or two weeks longer than the unsalted. I tried a portion with double salting right across the field, crossing the unsalted strip at right angles, but I could not see any decided difference between it and the other.”

Mr. Hobson, of Wellington, mentioned that, some years ago, he had fifteen acres of wheat, in one field, with a clay loam soil and undulating land. He selected ten acres upon which he put salt, and left the other five acres without any. The result, he says, was, “The wheat sown on the five acres without salt fell down, and was almost worthless, while the other stood up and was very fine.” He has used salt ever since, generally applying about four hundred pounds weight to the acre.

The price of salt for fertilizing purposes at Brooklin (Ontario) has been already mentioned as \$6. Its price at the works at Goderich, Clinton, Seaforth, or Kincardine, would range from \$2.50 to \$3 per ton, and probably \$20 would pay the freight of a car load of salt from any or either of these places to Toronto, a car being understood to hold 12 tons. It is easy on this basis for our farmers to calculate the cost of salt delivered in their respective localities. The evidence on this point, with scarcely an exception, appears to be completely in favour of the use of salt as a fertilizer; and, in view of the importance of enriching the farm in every way, promoting the growth and protecting the early plant of the root crops against the ravages of the fly, and of encouraging the use of every conceivable remedy for the troubles that assail the spring wheat crop, it is to be hoped that, in future, the use of salt by farmers will continue to increase, and the young and rising Canadian salt industry find its interests thereby greatly promoted.

Refuse Salt.

It may here be remarked that some farmers from motives of economy, others under the idea that, for some reason or other, it is stronger or more stimulating, are in the habit of purchasing refuse salt, which is sold for a trifle less than the ordinary salt by the manufacturers. Except that it is of a dirty brown colour, being the scrapings of the pans when they are periodically cleaned out, and so as a certain amount of foreign matter mingled with it, there is really no difference between the refuse and the common salt. The quantity to be had is very small, and no possible benefit can be received from its use beyond that derived from the use of the pure article.

Few branches of their investigation have given the Commissioners greater pleasure and satisfaction than that into the use of salt in connection with agriculture and cognate industries. They are quite aware that the salt manufacturers of Canada labour under some considerable disadvantage as compared with those elsewhere. A very high fiscal duty limits their trade with the United States, and it is no small tribute to the purity of Canadian salt that, notwithstanding this impost, avowedly for the protection of American salt manufacturers, Canadian salt is used in immense quantities in the great American pork-packing centres. On the other hand English salt is brought to Canada in vessels coming out, otherwise empty, in order to obtain freights of grain or lumber from this side, and consequently salt is carried to Halifax, Montreal or Quebec, at little more than ballast rates. English salt is admitted free of duty, although a duty is imposed by Canada upon American salt. The effect of English salt, being imported in such large quantities in the interest of our fishermen, and the population of the Eastern and Maritime Provinces is, to limit the area very much over which Canadian salt can be profitably distributed.

CHAPTER XIII.

GYPSUM, BONE-DUST, AND PHOSPHATES.

The use of salt in connection with agriculture, and its value as a manurial agent, will be properly supplemented by some notice of other substances coming under the denomination of special fertilizers. If these important auxiliaries of the agriculturist are not used more extensively than at present it is not because an ample supply from home sources is wanting. Accessible with the least possible amount of mining, are found, on the banks of the Grand River, along a line stretching from Cayuga to Paris, magnificent and practically inexhaustible beds of very pure gypsum. Of bones, the surplus exported is very large indeed, and in some of the eastern counties of the Province of Ontario as well as in the contiguous part of the Province of Quebec are immense deposits of mineral phosphate. In those portions of the Province of Ontario where access by water from the States reduces freights, gypsum can be imported in the rock state, and, as no duty is imposed by either country on this product, the Grand River deposits are freely exported to those places in the United States that are most accessible from western Ontario. The Commissioners deemed it well to give particular attention to this branch of their inquiry, and held sittings both at Galt and Toronto in order to take evidence of a practical and scientific character as to the application and beneficial effects of the several fertilizers mentioned at the head of this chapter.

Gypsum or Land Plaster.

Mr. W. Hamilton Merritt, manager of the Grand River Gypsum Company of Cayuga, after describing the process of mining, and grinding the Gypsum to powder, says :—

“Our gypsum is white. It is pure gypsum. Of the gypsum in the beds worked by the Grand River Gypsum Co., Sir William Logan, F.R.S., in his Geological Report for 1866, states regarding their quality that it is ‘exceptionally pure.’ I have visited gypsum beds in England, France and the United States and never saw a mine where a purer quality was obtained. Land plaster is supposed to be gypsum, as a rule, and that, chemically pure, is a white substance composed of thirty-three parts of lime, forty-six of sulphuric acid, and twenty-one of water of crystallization. I believe that the only part of Ontario in which gypsum beds are found is along the Grand River. They are only found besides (in Canada) in Nova Scotia and up in the Saskatchewan district. The Grand River ones are situated

below Cayuga, above Cayuga, and in the neighbourhood of Paris. The gypsum found in these beds is not altogether the same in appearance."

Mr. John Allan, of the firm of Gill, Allan & Co., of Paris, is one of the proprietors of mines both at Cayuga and Paris. His description of the Cayuga beds would, of course, be the same as that given by Mr. Merritt. Of the Paris beds he says:—

"At Paris the gypsum underlies limestone, and there are several seams, each from two to five and a half feet in thickness, which are now being worked. Below the river level there is a bed of white gypsum about four feet in thickness. The Paris gypsum is generally called 'gray,' but the colour is not so marked as in the Oswego article."

Mr. Merritt says with regard to the purity of Canadian gypsum as compared with that of the United States:—

"There was a piece of the Oswego gypsum given to me at the mines by the manager; he knew who I was, and therefore certainly did not give me the worst specimen; I could see from the surrounding rocks that it was one of the best; and that contained 55·67 per cent. of pure gypsum as against 79·07 contained in the white Grand River gypsum, according to the report of Mr. Heys, by whom it was analyzed. In the Oswego gypsum there was, of insoluble matter, which would be chiefly sand, 4·8, while in ours there was no insoluble matter; of iron and alumina there was 1·4 per cent. in the Oswego, and in the Grand River there was just a trace; of carbonate of lime, which is chalk or limestone, there was 13·31 in the Oswego, and a trace in the Grand River. Of carbonate of magnesia there was 5·7 per cent. in the Oswego; that, they claim, has of itself a fertilizing property; I do not think it has. There is none in ours. If carbonate of lime would not be a fertilizer I should not think it probable carbonate of magnesia would be. Of water and loss there was 18·12 per cent. in theirs, and 20·93 in ours. We claim that ours is about 30 per cent. purer than the Oswego. That remark applies to all the Cayuga and Caledonia beds of white plaster."

As to the relative merits of the white or gray Canadian gypsum, while no doubt the colouring matter is, in one sense, an impurity, Mr. Allan, who has an equal interest in both, says:—

"My opinion is that the gray plaster is more valuable than the white for fertilizing purposes, on account of its solubility, which has been shown by tests on the land. The Cayuga white plaster is more crystalline than the Paris gray, and it therefore takes longer to dissolve. That is the reason why the immediate results are more satisfactory from the gray plaster than from the white, although there may be a better result from the white plaster in the second and third years. We sell both white and gray land plaster of our own manufacture. I filtered some of both kinds through water, and found that there was from five to eight per cent. greater solubility in the gray than in the white; that is, the water took up from five to eight per cent. more of the gray than the white. Another test showed eight per cent. more of solubility in the gray than in the white."

Cost of Gypsum.

It is probable that, for practical purposes, the question of freight as affected by distance and situation will have more to do than the colour with the choice of

the farmer, as between the two varieties. "The prices are," says Mr. Allan, "about as follows:—

"The cost of gypsum at the mines is \$4.50 by the single ton. It is mostly sold in bulk, as it has been found too costly to put it in packages and barrels, although considerable is sold in that way. The price is of course less when larger quantities than a single ton are purchased. The high rates of freight charged for the transportation of land plaster have an important effect in limiting the quantity sold. Lumber rates are charged, which are considerably higher than are paid for coal. This precludes the sale of land plaster at points much farther distant than one hundred miles from the mines. We are confident that more liberal rates of railroad freights would largely increase the sale of land plaster. The cost per car, of sending gypsum from Paris to Toronto, is \$18, and the car contains 12 tons. From Cayuga to London the cost by the car-load is \$1.40 per ton; from Paris to London \$1.20; from Paris to Goderich about \$2.00. It costs in Toronto about \$6.00. The plaster from Grand Rapids comes over in barrels; that from Oswego comes in rock, and is ground on this side."

Mr. Merritt mentions a somewhat lower price as the rate at which the Cayuga gypsum is sold, but it is not likely the difference is very considerable either between the two companies at Cayuga or between Cayuga and Paris. Mr. Merritt says:—

"We can lay gypsum down at about \$5 a ton in Toronto in bulk; that is \$60 for a car-load. I think a barrel of Oswego plaster costs, laid down in Toronto, 80 to 85 cents. They pay 65 cents in Oswego, I believe, and then the freight is very small, being return freight. We could lay ours down in Toronto at about 70 cents a barrel without the barrels. The farmers seem to think that there is more virtue in gypsum in barrels than in what is in bulk, which is a mistake. We can deliver ours in bulk as cheap as, or cheaper than the Oswego in barrel. The Oswego gypsum is of a gray description, and the colour is due to slate and sand. There is about 25 per cent. less gypsum in it than there is in the white."

How Gypsum affects Vegetation.

Professor Bell, speaking as an agricultural chemist, of the effects of gypsum says:—

"There are two ways in which the use of land plaster assists vegetation, first by supplying sulphuric acid or sulphur, which is an important ingredient, especially in the seeds of plants. It also supplies lime in a soluble state. The sulphate of lime is slightly soluble. Four hundred and sixty ounces of water would dissolve one ounce of pure sulphate of lime or gypsum. Its other benefit is its mechanical effect in absorbing ammonia, which is an important element in vegetation. It also makes a double combination with some alkaline salts.

"Plaster is much more effective in wet than in dry seasons, as a much larger portion of it dissolves and becomes available. It will not act so beneficially in soils in which there is a sufficient quantity of lime as in those in which it is deficient, and the reason it gives out in new land is that lime is mostly present in excess."

The remarks of the Professor confirm the opinion of Mr. Allan, that the dryness of recent seasons has led to a somewhat diminished use of plaster, its effects having been less observable than when the atmosphere was charged with a greater quantity of moisture.

Use and Value of Gypsum.

As to the purposes to which gypsum is applied. Mr. Merritt says:—

“The class of crops for which we chiefly have a demand for gypsum are clover and leguminous plants, turnips, and that sort of thing; it is much used on corn and potatoes, and some have used it on both spring and winter wheat, oats, barley, and rye, besides fruit trees and garden plants, with good effect.”

Mr. Allan says:—

“Gypsum has its special place in agriculture, and farmers who expect it to benefit all crops directly will be disappointed where it has not been used intelligently.

“For clover it should be sown early, say about the first week in April, never less than 100 lbs. to the acre on light soil. Then after the plant is well started, say about the first or second week in May, a second top-dressing of 50 lbs. to the acre. The trouble and slight additional expense will be well repaid. Fifty cents' worth of land plaster applied in this way will produce an average gain of over \$3.00 per acre, over a crop not treated with gypsum.”

The use of gypsum in connection with barn-yard manure has already been noticed. It is further referred to by Mr. Allan in his evidence. He says:—

“I believe that the opinion is now generally held by the better class of farmers, and by those who have given this question a good deal of attention, that the best way to use land plaster is to throw it on the manure heap. Land plaster sometimes fails from atmospheric causes when thrown on the land, but it can never fail when thrown on the manure heap. It keeps the ammonia in the manure, and leaves it in the very best condition for throwing upon the land.

“One gentleman said he believed it trebled the value of barn-yard manure when properly used, and his method of using it was this: when he found ammonia escaping he spread plaster on the manure heap three times, at intervals of a day or a day and a half, and by that time the ammonia was fixed, and the manure was rotted properly, and he carted it into the field and spread it from the waggon.”

Of its value in the stables and byres, as a means of fixing the ammonia, enough has been said already. The opinions of practical farmers and their mode of applying the gypsum will now require notice.

Experience of Practical Farmers.

Mr. James Cowan, who is well known in western Ontario as one of the most successful farmers in the County of Waterloo, has used plaster for nearly fifty years. He says:—

“One year I experimented with plaster from Nova Scotia, Caledonia, and Paris; also at the same time with unleached ashes. The result from all the different plasters was equally good. The land sown with ashes was no better than where nothing was done to it. When I seed down with fall wheat, I sow plaster to benefit the clover, not the fall wheat. I found that plaster had a tendency to increase the straw and induce rust in fall wheat.

“For the purpose of seeing what effect plaster would have on fall wheat, I sowed a single cast of plaster across a field of fall wheat. The track of the

plaster was quite conspicuous; the wheat stronger and taller than the rest of the field, white and red clover growing at the foot of it, while on the other part of the field no clover was to be seen. The wheat, though later, was not perceptibly injured by the rust, the reason, I think, being that that was not a year in which wheat was inclined to rust. I have made no experiment which would lead me to conclude that the use of gypsum had been the means of preventing rust. The use of it increases the quantity of straw, and causes the wheat to be a little later in ripening. I have not found that it makes the head any larger. Clover is the principal crop to which I have applied gypsum.

"I remember a field that was seeded down with what we call the big kind of clover; and where I put plaster the clover was so heavy that we could scarcely cut it, while on a small piece which I left unplastered for an experiment, there was hardly anything to cut. My ordinary course is to cut one year and pasture another; but I do not remember what I afterwards did with that field. When I came to the Township of Waterloo, it was said among my neighbours, 'Cowan may be a rich man, but he will have poor children.' In other words, that I would kill my farm by using plaster."

Mr. Cowan appears to have demonstrated very conclusively that the effect of the plaster is not exhausted in one season. He has never seen it fail except in very dry seasons, when, for reasons already suggested, the want of moisture prevented its absorption.

Mr. Andrew Telfer, of South Dumfries (Brant), gives the result of his experience as follows:—

"I have principally used gypsum. On turnips I have used gypsum and salt together. I mix them and sow them broadcast. I drill up my ground before sowing them on the roots. I use gypsum alone, principally for clover. I do not put gypsum and salt on turnips after the crop has grown; I put them on the land before drilling. I have never used salt by itself.

"The farm which I occupy and that of my brother were formerly one farm. It was divided some years ago. My brother used no gypsum, but I did, and this year I had a larger hay crop than he. I got nearly two tons per acre off my land, while my brother did not get one. I had not applied any manure but gypsum to that. My brother had not applied any at all, either farm manure or anything else. The position of the fields in the two cases was the same; they were both on high land; I could not see that, in that respect, one had any advantage over the other. They were both about equally exposed. We have used plaster ever since we came to this country, which was over thirty years ago. We are about three miles from the plaster beds. Plaster has been obtainable from them during all that time. I am getting it now in a much finer state than it was in formerly. I think that, being finer, it will do more good; it will be absorbed the more readily.

"I applied a little of it this year to my fall wheat, leaving a part of the field without any on it, and now you could almost mow the part of the field on which I put it—the clover is getting out in head, while on the other part you can see the stubble quite plainly across the field.

"I have used gypsum on corn, and find that it produced a great effect upon it; it makes it stronger, and causes a heavier crop, I think. The reason that I combined gypsum and salt was that a neighbour told me he had tried them together with good results. The use of them on turnips has been to give me

heavier crops. I cannot say that the use of salt and gypsum together has caused the crops to grow faster."

Mr. Daniel Perley, of Paris, who is heard from as an enterprising Southdown sheep breeder at most of our exhibitions, has had experience of plaster ever since he was ten years old. He then resided at Ancaster, in Wentworth, and he told the Commissioners how greatly people at that time were prejudiced against the use of gypsum. He says:—

"We have always used plaster since I was ten years old. I saw a great deal of plaster sown on our place in the township of Ancaster. The people there used to say it would spoil the ground; but I was only there till I was ten years old, and the ground was good then, and I have seen it every few years since, and it is fully better now. Plaster has been a help to any ground I have ever seen it sown on. The land I am on is a clay loam with limestone bottom. I follow mixed farming. I have always found any gypsum that I have sown to be an advantage. My father always considered that 130 pounds of plaster gave him a quarter of a ton of hay. That amount of plaster would be worth about 30 cents. I follow a regular rotation of crops. I have always used gypsum on barley. I generally sow my turnips, and then sow the plaster over the ridges. I sow it broadcast. That, I consider, keeps the fly off for a day or two. I do not think plaster does any good sowed in dry weather. I do not think there is any use in putting plaster on the plant; it must be sowed early. Even if you could keep the plaster on the plant, I do not think it would do a bit of good; it must get to the ground."

Mixed with ashes to the extent of about 20 or 25 bushels of ashes to 150 or 200 lbs. of gypsum to the acre, Mr. Perley has found it answer well on corn. He says:—

"The result of applying it to corn is that you get as large a quantity of stalks the first year as you would of hay; and then I think it is a help the next year for the barley. My rotation of cropping is wheat, barley, then seeded down, then hay, then hay or barley. I always have barley after wheat. I might not sow gypsum on the wheat; but that would be the only year I would miss sowing it. I generally plough up sod and put in oats, and the next year put roots in on the clover sod with barn-yard manure."

Mr. Andrew Elliott, of North Dumfries, whose evidence on other subjects has been previously referred to, has also used plaster extensively. He says:—

"I have sometimes put in a strip of roots with salt alone, and another with plaster alone, and sometimes a strip without either, and I have found the best results to follow the use of salt and plaster mixed. There is no doubt a greater benefit is gained from the use of plaster alone than from the use of salt alone. Salt and plaster mixed have a specially beneficial effect, not only on the turnip crop on which they are used, but on the succeeding barley crop also. On the barley crop the difference is so great that a stranger going through the field could distinguish a strip to which they had not been applied. If a field grows dirty I generally put in turnips, and I consider that turnips take pretty well the place of summer fallow to me. I never had a season when I have not considered that the application of plaster was worth double its cost to any crop I sowed it on, and on clover it will double the crop."

"I sow it on all crops, and generally with good result. We are never troubled with rust as some parties are; but I have found that plastering fall wheat in the fall does away with the danger of rust, and materially affects the crop. I do not apply plaster in the spring if it is applied in the fall. I invariably apply it to barley whether I seed down or not.

"This year I had a field of twelve acres of barley on wheat stubble. There were two crops of hay on the field, and immediately on taking the last crop of hay off I ploughed the field and put it into wheat. About three acres of that field was manured last fall with the scrapings of the yard, and the balance was not manured. I sowed plaster and salt in the same field, both separately, and I left a strip without either salt or plaster on it, and the grain there was not so strong, but was badly crinkled down. On each side of that again I left a piece, the one sowed with salt and the other with plaster, and I cannot say that there was much difference between the grain on the two, but neither of those strips was as good as the grain on which salt and plaster were applied together."

Mr. David Gibson, of North Dumfries, has used plaster off and on for twenty-five years. He has also experimented with Caledonia, or Cayuga plaster, and the plaster obtained at Paris, with, as he thinks, the result of showing the latter to be the best in point of quality as a fertilizer. He says as to his application of the plaster to crops:—

"For some years I have tried salt, plaster, and ashes, mixed together on turnips. I think I have not tried salt alone. On one occasion I found these three articles mixed together to be a great benefit to the turnips; I think turnips come up better. Then, after we thin them, we sow the mixture again, and I think it keeps the worms off. In the first instance we have the ground all ready for drilling, and just sow the plaster on the surface. We then bring the two furrows together—that puts it in the centre."

Mr. Neil J. Campbell, of Nelson (Halton), says:—

"We have tried land plaster, sowing 6 or 7 tons. I sowed 5 tons on spring wheat in 1877 with good results; the wheat was the best in the neighbourhood. In that year, when there was a great deal of rust and shrinkage in the wheat, 12 bushels to the acre was considered a good crop; but we had 17 bushels. We sowed from 250 to 300 pounds of land plaster to the acre. We have also used it on clover with very good results. We always thought that we had as good results in the second year as in the first."

Mr. Alexander Barrie, of Galt, owns a farm that has been under the influence of gypsum for thirty years. He has used it chiefly on clover and peas. He says:—

"I have frequently sowed plaster in the spring of the year on clover as soon as the first leaves were sufficiently developed; and I think that is the best time to sow it. In doing this I have sometimes missed part of the clover, and if the atmospheric conditions were favourable, I have been able to trace the difference immediately between the clover on which plaster has been sown and that on which it was not. I have intentionally left a portion without plaster for the purpose of experimenting. I have not made any test as to quantity. Besides clover I have

used gypsum on peas to good advantage in the early part of the season to assist them in growth.

"This season by way of experiment I used it on barley. I got a fertilizing drill with a view of using artificial manures more than I have hitherto done, and it sowed from 150 to 400 pounds of plaster to the acre, the fertilizer depositing the plaster with the seed in the ground, and after I reaped the barley I saw no perceptible effect whatever, either on the barley or clover. This season was very favourable to making the test. The gypsum would have had a good effect if it had been sown as a top dressing after the barley and clover were braided. I sowed salt and plaster mixed together. I sowed it with a drill, and it had a most decided effect. I sowed that on barley on the same farm. The field on which I sowed gypsum alone on barley had been under grass for a number of years. The field that I sowed plaster and salt on had been eight years under grass. There had been no other fertilizer employed on either of them."

Mr. Barrie adds:—

"I had used salt and plaster previously on turnips. Those I sowed on a field of which I had manured a portion with barn-yard manure. On another part of the same field I used unleached wood ashes, and on another I used salt and plaster, and I could not see any decided difference, except that, where I sowed the salt and plaster, the plant was somewhat more vigorous."

Mr. Merritt, while under examination having mentioned that he had not long since received a letter from the late Hon. George Brown, in which the advantages of using gypsum, and some of the objections urged against it, were discussed, the Commissioners decided, in view of the eminent position of the deceased Senator as an experimental agriculturist, and the great opportunities the large growth of green and root crops at Bow Park had afforded for testing the use of gypsum, to admit the letter (the original having been produced) as evidence. It disposes of the pros and cons in the premises in the terse and vigorous fashion so characteristic of the writer. The letter is as follows:—

Letter from the late Hon. George Brown.

TORONTO, 18th March, 1880.

MY DEAR SIR,—I am very much interested in your proposed enterprise on the Grand River. I have been a large consumer of land plaster for over twenty years—many of these years to the extent of fifty tons per annum, and have not only been entirely satisfied with its singular effect on the crops, but astonished that any farmer can afford to carry on his farm without its assistance. Its effect on clover, peas, Indian corn, and indeed on all leguminous crops is magical. A good dressing of it, say 200 to 300 pounds per acre, will make all the difference between profit and loss on the crop of a field.

An old complaint against plaster is that it has a wonderful effect for three or four years, but that the land then becomes what is called "clover sick," and its power ceases to be felt. I think this is a misapprehension—nay, from much experience, I may say that I know that it is so. The true explanation of the "clover sickness" may be found, I am confident, in the great exhaustion of the land by the large crops taken from it, through the stimulating effects of the gypsum—and

the failure to restore the other elements of plant growth that have been exhausted by the same process. Exhaust the land by great crops, and trust to gypsum solely for a continuance, and you may be disappointed; but couple with it a good dressing of barn-yard manure and you will not complain of your crop, or of your land as "sick."

Another objection to plaster is the disagreeable task of sowing it—burning the fingers, flying in the eyes, and so forth. Also that it takes a great while to sow a large surface with it, and just at the moment when the spring work demands all the strength, and more than is available to the farmer. But all these objections are met by an admirable machine, constructed for the purpose of sowing plaster, made by Mr. John Watson, of Ayr, and by the use of which the laziest lout in the land can sit at ease behind his horse, with a stream of gypsum ten feet wide following behind him with perfect regularity, and with any desired weight to the acre, at the rate of twenty acres per day.

I have always held it as most unfortunate that the vast benefits to be derived from the use of gypsum are unknown to so large a body of our farmers, that even those who know and confess these benefits, avail themselves so little of them, and that some combined movement of railway companies and gypsum companies has not been made to establish gypsum depots at railway stations, so that it would be of easy access to farmers all over the land at reasonable cost. Nothing could contribute more to the rapid increase of crops in Canada than such a movement efficiently carried out. It would pay the railways to carry gypsum at the very lowest rate of freight, in view of the increased volume of produce and live stock freight it would secure to them.

I wish you great success in your enterprise—it is fortunate for us when our occupation is not only a natural and a pleasant one but contributes to the welfare of our country. If it be true that a man is a benefactor to his country who makes a blade of grass grow where none grew before, what must he be who makes the half-dead-and-alive pasture fields, that we see so painfully numerous over our country, rich with green verdure.

Believe me, faithfully yours,

GEO. BROWN.

WM. HAMILTON MERRITT, ESQ.

Quantities Applied and Mode of Application.

In the foregoing letter the quantities of gypsum that may be profitably used, and the way of applying it, are referred to. A little more information on these points may be acceptable.

Mr. Cowan says:—

"I have plastered on the snow. Generally I try to put the plaster on before the land is fit for ploughing in the spring; but I do it then more for convenience than because I think there is any special benefit in doing it at that time. I put it on from very early in the spring until the crops are too far advanced to be benefited by it. My land is generally a heavy clay loam. The subsoil is gravel when you go deep enough, but very few trees that fall turn up gravel. Where the land is wet I use no plaster. I do not think that, as a rule, we have put any on where there are under-drains; the land is still damp enough, and produces plenty of straw and hay without it. I have never heard it complained that the application of plaster makes clay land stiffer and harder to work; but my land has now got to be a good deal stiffer and harder to work than it was.

"We sow the gypsum all by hand. I have never seen any machines for the purpose of sowing it. I think I have heard of one. I have said that I would buy one, irrespective of cost, if it would suit me, because it is not a very pleasant job to sow gypsum by hand. I have not intentionally used over 100 pounds of gypsum per acre, though I may have exceeded that amount; generally I keep it under 100 pounds. If a field lacks straw I sow a little gypsum on that. I have not used it on peas of late years, except when they were looking a little sickly. They generally seem to grow strong enough without it now, a fact which I attribute to the plaster which has already been put on the ground. I have used from five to ten tons of plaster a year for many years past."

Mr. Telfer says:—

"When I use plaster alone I use about 100 pounds to the acre. If the plaster is sowed late in the season it induces rust; I mean after the plant has got pretty well advanced—either wheat, barley, or anything else. One year we sowed it on wheat late in the month of May, and we were fully a week later in cutting this than in cutting wheat on which it was not put; it came up very rank and got rusty. I cannot remember when that was; it was some years ago. I cannot say whether it was a year that rust was very prevalent or not. I sow the plaster by hand. I would very much like to have some improved way of distributing it. I have not yet found any machine for doing it satisfactorily."

Mr. Perley has invented a machine of his own for sowing gypsum. He says:—

"For, I think, twelve years I have worked on my roller a machine for sowing gypsum. I sow about six or seven tons a year with it. It is attached to the roller behind. It only cost me \$15. The boys object to sowing plaster by hand; it gets in their eyes. My machine works with a slide; and it is turned by a little pinion on the end of the roller. I can sow with it from 50 pounds to the acre to 500."

Mr. Allan says:—

"It is generally used on corn by putting a spoonful in the hill along with the corn seed. The general opinion is that it should be sown for clover, as soon as the farmers can go on the land in the spring. It is sown broadcast.

"By sowing land plaster as early as possible it meets the spring rains and heavy dew, imparting strength to the plants, thereby protecting the roots from the heat of the sun, and keeping the soil cool and moist. The clover thus treated must give a better yield than if left to combat the dry weather without assistance.

"For clover it should be sown early, say about the first week in April, never less than 100 pounds to the acre on light soil. Then, after the plant is well started, say about the first or second week in May, a second top-dressing of fifty pounds to the acre. The trouble and slight additional expense will be well repaid. Fifty cents' worth of land plaster applied in this way will produce an average gain of over \$3.00 per acre, over a crop not treated with gypsum.

"The value of gypsum as a manure is because of its solubility. It dissolves in water to the extent of one part in four hundred and sixty-one. One imperial gallon of water will dissolve one ounce of gypsum. If the land be deficient in lime, the gypsum will act because of the lime it contains, as well as the sulphuric

acid. Sulphate of lime is more likely to benefit red clover, and sulphate of potash the white. The kind of manure used, and the quantity also, ought to be determined by the nature of the soil and the crop to be raised."

Some farmers complain they get no results from their plaster, when, on inquiry, it has been found they had used only some 50 pounds to the acre. In this, as in some other cases, the truest economy is to be found in liberality.

Professor Brown, it will have been noticed, uses 200 pounds of gypsum to an acre of land, in conjunction with other manures.

Mr. Telfer uses 100 pounds of plaster to 200 pounds of salt per acre. Mr. Perley sows six or seven tons of gypsum every year, and about the same amount of salt. Mr. Barrie uses about 200 pounds to the acre. Mr. Elliott mixes salt and plaster in the proportions of about 200 pounds of each.

It has been alleged that gypsum, after a time, loses its effect. In the letter written by the late Hon. Geo. Brown, quoted above, it will be observed there is a probable cause assigned for this. There is no evidence at all to show that even if persistently and liberally applied it will act injuriously. The evidence, at all events, of the very intelligent persons whose experience is above detailed, not only encourages the use of this fertilizer, but indicates that hitherto far too little advantage has been taken by the agriculturists of Ontario of the rich contribution to their needs nature has provided almost close to their doors.

Bone Superphosphate.

The value of bones as manure is very generally understood, although too seldom practically acknowledged by their use. Canada, according to Mr. Daniel Lamb, of Toronto, a witness before the Commission, enjoys the not very creditable position of being "the only agricultural country in the world that exports bones." The bone that would be invaluable as a fertilizer of our soil is sent to the United States, where it is manufactured for use on the crops of the American farmer. Mr. Lamb says:—

"Of all the material we handle that can be turned into superphosphates, we export ninety-five per cent., and only manufacture five per cent. for use in Canada. That ninety-five per cent. we export in the shape of bone. We export over 2,000 tons of bone annually from Canada. We do not export superphosphates, but manufacture just sufficient to meet the demand. It would not pay to manufacture for export, as the sulphuric acid is dearer here than in the United States. We manufacture about 100 tons of superphosphates annually.

"The use of superphosphates is very limited at the present time. Canada is the only agricultural country in the world that exports bones. These bones are sent to the United States and manufactured into fertilizers there—where there are many works that manufacture 30,000 tons a year. The amount of superphosphates imported into this country is very limited. There is no duty on it; all fertilizing materials are free. But we supply, practically, the whole demand, with the exception of mineral phosphates."

As the firm to which Mr. Lamb belongs is the only one manufacturing bone superphosphate in the country, and their sales are but some 100 tons annually, it is evident the quantity of this fertilizer used is quite insignificant. Mr. Lamb may supply one explanation of that circumstance when he says:—

“It should not be applied where there is a limestone formation, because the lime absorbs the sulphuric acid contained in the soluble phosphates, and causes it to revert back into insoluble phosphates, and depreciates it one-half its value. On such land I would always recommend the use of bone dust.”

Now, as a very large proportion of the soil of the cultivated area of Ontario contains lime, it is clear that, on Mr. Lamb's showing, the superphosphate is not properly applicable thereto. Still, the indisposition to use bone dust is hardly creditable to the intelligence of the farming community. There are, however, in Mr. Lamb's evidence, one or two points that invite comment. In the first place, the only testimonials he was able to produce from agriculturists who had used his superphosphate were nearly fifteen years old. Now, if only 100 tons are sold annually, it would have been interesting to know to whom even that quantity is sold, and whether any one was prepared to give evidence, oral or documentary, as to the permanent or continuous effects of superphosphate on the land. The late Hon. George Brown's statement, dated September 15th, 1866, produced by Mr. Lamb, was very favourable, but general. That of Mr. W. Whitelaw, of Guelph, a member of the Commission, dated September 7th, 1866, was also favourable and more specific. It was in the form of a letter to the *Canada Farmer*, and was as follows:—

“I take the liberty of giving you the result of an experiment made by me last season on a field of turnips, for the purpose of testing the qualities of the different manures; a part of the field getting no manure of any kind. All the manures were put in the drill and ploughed under, and the various lots were sown about the same time, and received the same treatment through the summer. When taken up, a quarter of an acre of each lot was staked off and carefully measured, giving the following results. If taken by weight the yield in each case would have been much greater:—

Lot without manure of any kind produced at the rate of	360 bushels per acre.
Lot with 600 lbs. bone dust per acre, cost \$7.50	534 “ “
Lot with 350 lbs. superphosphate of lime per acre, cost, including freight, \$7.50	625 “ “
Lot with 220 lbs. superphosphate of lime, 7 loads of manure per acre	635 “ “

“The super-phosphate of lime was purchased by me from P. R. Lamb & Co., Toronto. As to whether it will pay to purchase these manures, I will leave your readers to draw their own conclusions.

“W. WHITELAW.”

A letter from Mr. George Woodriff, of the County of Huron, was as follows:—

“GENTLEMEN,—I have great pleasure in testifying to the excellence of the superphosphate I purchased from you in the spring. I applied the article to clover, but not to the entire field, and I am sure I am quite safe in saying that the hay crop was trebled where it was top-dressed with your manure. The rest of the field carried but a poor crop. In short, the thing paid.”

Of the absolute *bona fides* of these letters there would of course be no doubt, but there the practical evidence adduced by Mr. Lamb ended.

Very frankly and courteously Mr. Lamb responded to the request of the Commissioners, to be informed as to the actual ingredients of his superphosphate. He presented an analysis made by Professor Heys, of Toronto, as follows:—

“The following is an analysis by Professor Heys, of the Ontario School of Chemistry and Pharmacy, of the superphosphates manufactured by us:—

Moisture	9.64	per cent.
Insoluble phosphates.....	31.24	“
Soluble phosphates	7.92	“
Ammonia	2.12	“
Soda salts	4.82	“
Organic matter.....	25.80	“
Sulphate of lime, etc.....	18.46	“

Mr. Lamb's own statement in regard to the foregoing analysis is as follows:—

“The analysis shows 9.64 per cent. of moisture, which of course is valueless, 25.80 per cent. of organic matter, which is of nominal value, and 18.46 per cent. of sulphate of lime, which is also of nominal value. That leaves 14.86 per cent. of soluble phosphates, ammonia and other salts, all of which may be regarded as immediately valuable and direct in their operation, and 31.24 per cent. of insoluble phosphates, a portion of which, such as the bone, might be immediately absorbed, but the larger portion of which would require a further process of decomposition, and therefore might be regarded as only valuable in the second or third year.”

The use of converting the phosphate of lime into superphosphate by the action of sulphuric acid, is to render it immediately soluble. If anybody wants to buy phosphate of lime, he may do so in the shape of bone dust, in which it is the chief ingredient, which will be slower in its effects becoming absorbed more gradually, but still represents value received. But what strikes the mind at once on looking at Mr. Lamb's evidence, and Professor Heys' analysis, is the very small quantity of superphosphate the purchaser receives for his money. If he buys common salt he gets from 97 to 98 per cent. of pure salt or chloride of sodium. If he buys Canadian Gypsum, according to Mr. Merrit's evidence, he receives close upon eighty per cent. of pure sulphate of lime. But, if he buys Mr. Lamb's superphosphate, he has, on the truthful and straightforward information of Mr. Lamb himself, only about eight per cent. of the article he is paying some \$30 per ton for. It may be convenient to reduce these figures to the form of an actual

transaction represented by the purchase of, say, five tons (10,000 lbs.) of superphosphate. First the buyer would get 964 lbs. of water, worth nothing. Then he would get 1,846 lbs. of gypsum (sulphate of lime) worth at Toronto some \$6 per ton. Then he would get 2,580 lbs. of organic matter, or animal matter, and worth possibly the same as gypsum per ton. These ingredients represent 5,390 lbs out of 10,000 lbs., or rather more than half of the whole bulk, and they would be worth nearly as under.

964 lbs. water.....	\$——
1 846 lbs. Sulphate of lime, say	5 50
2,580 lbs. Organic matter, say.....	7 74

Cost of 5,390 lbs.....\$13 24

Granting that the proportion termed insoluble phosphates is, although more tardily, still valuable, and that the ammonia and soda are also valuable, the fact remains, that, after deducting the amount for which 5,380 lbs. of water, gypsum, and organic matter, in the proportions named, could be bought, the farmer would, at \$30 per ton, have paid \$137 for 4,620 pounds, or a little over $2\frac{1}{2}$ tons, approximately \$55 per ton, and that, not for what he was supposed to be buying, but, as to two-thirds of it, what he had not bargained for. Very valuable manure, perchance, but not *the* manure he supposed himself to be paying \$30 a ton for. In fact, out of the whole five tons, or 10,000 lbs., costing, at \$30 per ton, the sum of \$150, he gets only 792 lbs. of the genuine article. The whole combination may form a useful manurial agent, but, reduced to its component parts, the modest proportion of the soluble phosphate irresistibly calls to mind, "the ha'porth of bread to an intolerable deal of sack." Some farmers met with by the Commissioners, however, have used the bone superphosphate with advantage. Mr. Barrie, of Galt, says:—

"I have used bone superphosphate this year, made in Toronto. It is just green bones dissolved in sulphuric acid, with a small amount of animal matter in it. My experience of that is limited to this year alone. I sowed it on my barley crop, with the fertilizing drill which I spoke of; but the drill did not work very satisfactorily, and I only got a small portion of it sown. Where I did sow it, it had a very decided effect in causing the barley to ripen at least four or five days earlier, and in giving a very bright appearance to the straw; but I have had no opportunity of deciding whether it increased the yield or not. I sowed some of it on the turnips this year, and so far it looks as if it had a beneficial effect on them. The turnips on which it has been sown have taken a considerable lead of those which are without it. It caused a very rapid growth of the turnips early in the season, and that protects the plants from the fly to a great extent. I find that gypsum does the same thing, but not to the same extent as the superphosphates. I have not tried salt alone for that."

Mr. James Thomson, of Brooklin, formerly used it freely, and, although it then cost him \$40 a ton, he says he is satisfied he got his money back, and a good percentage besides. Some dissatisfaction with the article supplied led Mr. Thom-

son to relinquish the use of the superphosphate. He now uses bone-dust, costing \$27 per ton, and says:—"I applied 350 to 400 lbs. to the acre. . . . Timothy, upon which it is sown, is twice as good a crop as that without it."

Professor Bell says:—

"I agree with Mr. Barnard, the Director of Agriculture in the Province of Quebec, that the phosphates may be used without converting them into superphosphates if finely ground, and that the beneficial effect will be more permanent, if not so sudden, as there are many substances which are perfectly insoluble in the mass, which become soluble when comminuted. I think it is folly on the part of our farmers to allow these valuable fertilizers to be exported to other countries, instead of using them on their own lands. They are beneficial to almost every kind of crop, and especially valuable in renovating exhausted soils."

How largely phosphate of lime, the principal ingredient in bones, enters into agricultural products, may be estimated from the fact noticed by Mr. Shuttleworth, of Toronto, another witness. Mr. Shuttleworth says:—

"It is a constant constituent of the bones of animals, composing a great part of their weight. It is also largely contained in milk. It is estimated that forty gallons of milk contain one pound of phosphate of lime; and the product of one cow will equal thirty pounds of phosphate per annum. This with the quantity required to form bone, will amount to fifty-six pounds, which one cow will take from the products of the soil during a year."

Mr. Shuttleworth goes on to say:—

"The great drain on phosphatic constituents must be made up by artificial supplies. These may be derived from, (1) guano, which contains, say, seven per cent. of soluble phosphates and twenty-two per cent. earthy phosphates; (2) bone dust, which is at least half phosphate; (3) coprolites, or fossil bones, containing not more than forty per cent.; or (4) apatite, or native phosphate of lime."

He remarks, too:—

"Guano is seldom imported into this country, and phosphatic manures from coprolites still more rarely. Bone dust is not much used, but it is a very valuable manure, even when unprepared by acid. The effect of one dressing of bones has been observed for sixty years, but the effect of finely ground bones is immediately realized. This arises from the animal matter which they contain, which is almost at once assimilated by plants; after this the decomposition of the bone proceeds slowly. Bones are very porous, and allow of the permeature of gases and water by which they are ultimately dissolved. Superphosphate made from bones is a very superior manure; better, perhaps, than that made from apatite."

Not merely the advisability but the great importance of using phosphate of lime in the most convenient or economical form is thus apparent. It will be observed that Professor Brown uses 300 lbs. of bone dust per acre in his manurial operations.

Mineral Superphosphate.

The mineral superphosphate is, as already mentioned, obtained in very large quantities in Eastern Ontario and in the Ottawa counties of Quebec. A great deal of activity has been displayed by some persons in the effort to secure its use

among the farmers of this Province, but with little success, the price, \$33 to \$35 per ton at Brockville, being a formidable objection in the eyes of many to experimenting with it. Mr. Shuttleworth, who, as a manufacturing chemist, but not connected with the production of the article in any way, gave the Commissioners the benefit of his evidence, speaks regretfully of the hesitation of agriculturists to try this valuable fertilizer. He says :—

“ Mr. Robison, the manager and principal owner of the chemical works, informed me that he had for a number of years tried to induce Canadian farmers to use superphosphate, and had spent many thousands of dollars in the attempt, but, so far, with very little result. There are, however, some farmers of the more advanced class who have learned the advantage to be derived from the use of mineral manures, and these are principally supplied from the Brockville works. ”

“ I do not think that the employment of fertilizers in Canada will be at all general so long as there is so much new land to be obtained. The establishment of agricultural colleges, and the superior education of the rising generation of farmers will, no doubt, hasten this result, and it is to be hoped that the labours of this Commission will not be without a very appreciable effect in the same direction.”

Mr. Shuttleworth thus explains the composition of the phosphate and its conversion into superphosphate. He says :—

“ The mineral apatite, as found in trade, consists of from seventy to eighty-five parts of phosphate of lime, a salt composed of eighty-four parts of lime and seventy-one parts of phosphoric acid. In this form it is almost insoluble in water, and is of little value to land. In order to render the phosphoric acid soluble, so that it may be assimilated by plants, it has to be changed in its chemical constitution, so that the proportion of lime to phosphoric acid shall only be one-third that of the native phosphate ; that is, twenty-eight parts of lime to seventy-one of phosphoric acid.”

Of the important part played by phosphoric acid in the economy of the vegetable kingdom, Mr. Shuttleworth says :—

“ Phosphoric acid, or its salts, is a constituent of all fertile soils. In such, the quantity present varies from one-tenth of one to one per cent. It is the characteristic constituent of the seeds of plants. Johnson,* whose work on agricultural chemistry I cannot too strongly recommend to the farming community, says, that one acre of wheat, say 25 bushels, contains 20 pounds of phosphoric acid ; an acre of barley, 25 pounds ; hay, 15 pounds ; and turnips, 54 pounds.”

With a view to cheapness, if it could be secured, Mr. Shuttleworth was asked whether the farmer could not become his own superphosphate manufacturer, purchasing the apatite or mineral phosphate in a crude state, and the acid, and making the superphosphate on the farm. He says :—

“ Supposing a farmer to have a quantity of apatite, ground to an impalpable powder, he might convert it into superphosphate by mixing three parts with two parts of ordinary sulphuric acid, diluted with about eight times its weight of water, stirring thoroughly. The operation might be performed in a strong wooden box or trough, made of one and a-half inch pine, with water-tight joints. For continued use the trough should be lined with sheet lead, with ‘ burned ’ seams, but

* Johnson's Lectures on Agricultural Chemistry.

for occasional employment this would not be necessary. After the acid is thoroughly mixed, and the conversion into superphosphate complete, the mass should be allowed to solidify, or be mixed with ashes, sand, or some absorbent materials."

But the first condition would be the hardest to obtain, namely, the reduction of the apatite to an impalpable powder. On this point Mr. Shuttleworth says:—

"The manufacture of the superphosphate might be carried on by the farmer, but the thorough powdering of the apatite, which is an essential step in the process, would be an almost insuperable difficulty. The apparatus for grinding is costly, and, were the powdered rock to be purchased, the saving would be inconsiderable. It has recently been demonstrated that the efficiency of the superphosphates is largely dependent on the pulverization of the apatite. Manufacturers in the Southern States, where large quantities of superphosphates are used for tobacco and sugar crops, are now very particular about this matter, not only to effect a saving of acid, but to increase the value of the manure."

He adds:—

"Taking everything into account, I think the preparation of the fertilizer would be better left to the manufacturers. The freight on the ground rock would be almost as heavy as on the superphosphate; the handling of acid would be dangerous in unskilled hands; and the finished product would probably be inferior to that which might be purchased from reliable parties."

Use of Superphosphate as Manure.

Mr. Neil J. Campbell, already alluded to in a previous chapter, a farmer of Nelson Township, Halton County, has raised large crops by the aid of the mineral superphosphate. Mr. Campbell was examined by the Commissioners as to his experience. He farms, with his brother, some 800 acres of land, and tries his experiments on a bold and liberal scale. He says:—

"We fallowed two fields, and ploughed and cultivated them in the same way. The soil of the two fields was similar, and the cropping upon them had been the same. They had been, as we thought, pretty well exhausted. We had sown one field two years in succession, and got no crop of any importance from it.

"Two acres of that field we covered with barn-yard manure to the extent of about twenty loads to the acre, and upon the balance of the field we put 250 pounds of mineral superphosphate to the acre."

The results are then detailed as follows:—

"From the time the blade appeared, any person could see the very place where the two manures were separated. The blade from the barn-yard manure came up quicker; the other came up very strong, and looking like barley, and it maintained that position during the whole of its course, standing erect and very strong. When the crop was harvested, the results were just about equal; we had thirty-five bushels of fall wheat to the acre from each."

The yield being equal, the next question is as to the comparative cost. On this point Mr. Campbell says:—

"The superphosphate costs \$40 a ton; the 250 pounds would therefore be \$5. Barn-yard manure, before it is put on the land, is generally sold at about 50 cents a load, so that what we used would be worth about \$10 in the heap. The

cost of drawing it and putting it on the land is very nearly equal to the cost of the superphosphate altogether, and is therefore much more expensive. At that rate the barn-yard manure put on the land was worth \$15, and the superphosphate was worth \$5; and in the first year the results were the same."

Here there was a clear saving of \$10, or \$5 per acre, besides the convenience of having an inexhaustible supply of the superphosphate if required, and the much smaller bulk to handle.

The effects, too, appeared to remain, for Mr Campbell says:—

"In the following year we seeded it down with timothy, and the growth of timothy was very rank—we never had anything like it. The land is still in grass this year, which is the third year of the experiment, and I still see no difference."

The next experiment was with the superphosphate alone:—

"The other field was sown at the same time. We did not apply barn-yard manure to that field, but sowed a portion of it with superphosphate and left a portion without any manure. We put on 375 pounds to the acre, and we had forty-five bushels of wheat to the acre at harvest time, an advance of ten bushels to the acre from adding one-half more of phosphate. In its general ingredients it was the same soil in both fields, the same seed and the same mode of sowing, though there was a little difference in the cultivation. I think that was a fair experiment. The wheat I have been speaking of is fall wheat."

For the 375 pounds of superphosphate to the acre, Mr. Campbell, according to his evidence, got 20 bushels of wheat additional, for he says:—

"Speaking generally, we obtain from twenty-five to thirty bushels to the acre from lands that we manure well, and we consider that a good crop. Some years we get more and some less. Our average, I don't think, would be more than twenty-five bushels, so that the result of the use of superphosphate was that we got twenty bushels to the acre more than our average, which we could account for in no other way, besides having the land after the crop in a condition of increased fertility."

The cost of the superphosphate at Nelson is \$37 per ton, including freight from Brockville, so that 375 lbs represents value in money of, in round figures, \$6.50, against a gain on the crop of wheat, of—at average market price—\$20 over and above the further beneficial results to a succeeding crop.

Mr. Shuttleworth gives some sound, practical advice to farmers as to the use of these special fertilizers. He says:—

"Although phosphatic manures are amongst the most valuable, it must not be supposed that their application will always be followed by beneficial results. It is only when the soil is deficient in phosphates that they are useful. Again, Liebig has shown that though all the normal constituents of a soil may be present they will not be taken up by plants except there be a supply of nitrogen as well, and if one constituent of a soil be absent vegetation will not thrive.

"Analysis would be the most effectual method of finding out what might be deficient, but as this is expensive, and often beyond the reach of farmers, the next best mode is to experiment with different manures, and by observing the effect, experience may be gained which may be utilized the next season."

An intelligent farmer will be always experimenting, not necessarily on a large scale, or at heavy cost. But the conditions of every farm are so varied and the circumstances of every farmer so different—that individual observation and discretion must be, and can be the only guides, aided by a general knowledge of the land, principles and materials with which he has to deal. There is, evidently, a very wide field for the exercise of such faculties in the application of special fertilizers.

CHAPTER XIV.

SPECIAL CROPS.

The time at the disposal of the Commissioners did not permit of any minute or extensive enquiries into the profitableness or applicability to the wants of the country of crops that may be termed specialties in agriculture. Investigations of this kind to be effectual require patient observation, and careful and minute investigation, before an opinion worthy of confidence can be formed from them, and are more fitted to the functions of a Bureau than to the means at the command of a temporary Commission. Incidentally, however, the growth of flax, tobacco, beans and sorghum were touched upon in the course of taking evidence, and may be briefly noticed in the present chapter.

Flax.

Mr. Jno. Donaldson, Dominion Immigration agent at Toronto, has devoted much attention to flax cultivation, and is the author of a rather widely circulated pamphlet on that subject. Visiting Ireland some years ago, he gathered up all the information he could on this question, and on his return, by meetings and the pamphlets already mentioned, sought to induce farmers to undertake flax growing as a branch of agricultural industry. The Counties of Wellington, Waterloo, Perth and Oxford are the principal sites of flax-growing enterprise, which is more particularly carried on by settlers of German extraction. For fibre, the chief market is the States, the manufacture of that portion of the product being confined in Canada to twines, ropes, cordage and seamless bags. There are two oil mills, as already mentioned in the evidence of Mr. R. W. Elliott; one at Toronto, owned by that gentleman, the other by the Messrs. Livingston, at Baden. The demand for the seed is unlimited. As to the adaptability of Ontario for the growth of flax, Mr. Donaldson says:—

“The best land for flax is a rich, friable clay loam, and a good subsoil. If you find land of this description, you can grow flax in any part of Canada. It has been discussed, whether flax is an exhaustive crop, and there are about as many of the opinion that it is, as there are of the contrary opinion.

“Farmers frequently sow flax after wheat, when the land is rich and in good tilth. It is cultivated broadcast. It requires to be well cultivated before the seed is sown; then harrow with a fine harrow, and roll. Farmers know quite

well enough how to grow flax. A bushel and a half is the proper amount to sow per acre. If the plants are few per acre, you have a rougher fibre, and if you want a fine fibre, you have to seed thick, about two bushels per acre."

Mr. John Beattie, of Seaforth, says:—

"I grow flax myself. Quite a number of farmers about here are growing it also. Flax does very well on rough land, which is newly broken up. The class of soil I prefer for it is a clay soil. A light soil does not do. I do not think flax is hard on the soil, because I have had good crops after it. I think it is a good thing to seed down with on old land. But I think a man, in order to make the cultivation of flax a paying business, must go into a German settlement where they will grow flax.

"Flax is a very excellent thing to spread upon land to make grass grow. I have had, I think, the best hay crops grown around here, and I don't know any reason for it except that I spread flax on the land.

"I don't think flax requires more manure than any other crop. I am of opinion that you can grow good flax on a field where you cannot grow wheat at all. Good strong land is not so essential for flax as clean land. The best paying crop of flax that I had was grown on an old field, and the only trouble I had was with some thistles. A farmer, to make flax growing profitable, should not sow more than ten to fifteen acres on a hundred acre farm. The flax is a capital thing to rot the sod, and I have seen just as good fall wheat after flax as I have ever seen grow."

Mr. Beattie's estimate of the cost of raising a crop of flax is as follows:—

"The cultivation of flax is very expensive; hand labour is nearly altogether required. Calculating seed, rent of land, ploughing and drawing, it would cost about \$19 to get the product of one acre to the mill. Another way we handle the flax is to furnish the farmer with the seed, and pay him \$12 a ton for his flax. We usually estimate on a crop of two tons to the acre, undressed.

"The undressed flax costs me about \$19 an acre. The flax business, at these prices, would pay very well, provided you could get a good crop, but you cannot gain anything if you have to handle a bad crop."

Mr. Donaldson says as to the custom generally prevailing in regard to flax cultivation:—

"There are no dangers to the cultivation of flax in this country at all. It stands the heat well, and it comes in between the hay and wheat harvest as a rule. The millers adopt the plan of giving the farmers \$12 a ton, they in the first place furnishing the seed to the farmers, and afterwards deducting the price of the seed, when the stuff comes to the mill. At that price, they would realize, on an average, \$24 per acre, the price of carrying it to the mill being included in that figure. There would be from 200 to 300 pounds of clear scutched fibre per acre, according to the quality of the flax."

Mr. Donaldson, it will be observed by the following quotation from his evidence, puts the cost of growing flax at a much lower figure than Mr. Beattie. He says:—

"It is chiefly in Wellington, Waterloo, Perth, and Oxford, they grow the most flax. You can rent land for flax in Waterloo from \$4 to \$5 an acre. Seed is worth \$1 a bushel, and it would require one and a half bushels to the acre. I think \$8 would cover all the expenses of an acre, including seed. Of course you can't fix the exact amount, because it depends on the nature of the land and other things. \$10 would cover all expenses, manuring and everything."

The extent of the profit on flax-growing will depend probably to a very large extent upon the facilities of the farmer who engages in it for obtaining the amount of hand labour required at a cheap rate. That, with favourable seasons, it may be made a profitable crop, is tolerably clear." Mr. Donaldson says:—

"The time for sowing is as early as you can get on the land in the spring. Flax is generally harvested by hand. There is no preparation before it goes to the mill except to dry it. It is bound up in small bundles, stooked and left to dry a few days, then taken to the mill and either housed or stacked out. At the mill, they have a machine for taking off the seed, which they can do very rapidly. I hold that, in all parts of Canada, we have land fit for the cultivation of flax."

The Commissioners strongly recommend the perusal by farmers, whose land, and arrangements generally are suited to flax culture, of Mr. Donaldson's pamphlet, which contains much useful information of the most practical nature on this topic.

Tobacco.

The cultivation of tobacco was only met with by the Commissioners in Kent and Essex. It was formerly carried on in those counties to a considerable extent, but present prices give it no encouragement, and the tendency has been, for some time, to limit the growth to very small proportions. Mr. McGregor, in his report, says:—

"I don't think tobacco culture is profitable in Essex, at the present time, or likely to become so. I don't think that there would be any advantage in growing it. It costs a large amount to cultivate it. It requires the richest soil, and it is susceptible to the frost. The market is also very fluctuating. The fancy for tobacco made from the plant grown in Canada has passed away in favour of tobacco made in the South."

Mr. J. P. McKinlay, of the Township of Howard, Kent, who formerly grew tobacco pretty largely, admitted that only the coarser sorts could be grown in Ontario, naming the Connecticut Seed Leaf, and Thickset varieties, as those cultivable. Farmers used to plant from one to seven acres, and realized in a good season about 1,500 pounds to the acre, or even more in some few exceptional cases. Mr. McKinlay says:—

"We generally succeeded in curing it in sheds and houses built for that purpose under cover. If it were not for the troublesome restrictions imposed by the Government, I think tobacco could be grown here with profit, and we could grow a good article.

"It is an excellent crop to prepare land for wheat, as the soil has to be so well cultivated. Even during the American war, no one went exclusively into tobacco growing, so that the crop did not work any mischief to the district.

"The tobacco worm was troublesome to the leaves sometimes; and, if it was left alone, would devour a considerable portion of the crop, but it was an easy matter to overcome it by hand-picking."

He adds, however:—

"The cultivation of tobacco is almost extinct in this district at the present time. It would be an exhausting crop to the land if it were long continued, but

when a man had a farm of 100 or 200 acres, he could grow two or three acres of tobacco a year, without serious injury to the soil, if he applied plenty of manure.

"We could not produce an article in Canada that would command anything like the prices which are obtained for the finer varieties. In fact, we only grow a second or third class article.

"I don't know that we had very much to grieve over when we ceased growing it; but it was a crop which suited farmers who had a family of boys, who could be employed in cultivating and taking care of the crop."

Beans.

If not confined entirely to the two counties of Essex and Kent, beans are, on a large scale, grown there chiefly, and appear to be both a profitable and popular crop. They are, however, strictly a local crop, doing well in certain situations only, in the districts referred to. For instance, Mr. McKinlay, who grows them extensively, says:—

"This is peculiarly the bean-growing section of Canada. There is only a small area of country suitable for growing beans, but I could not say what is the reason why our district is adapted to their growth. They will grow successfully in the western and south-western portions of the township of Orford, but they are a failure in the south-eastern part of the township.

"They are purely a local crop,—localized even in our district. In the lower portion of the township the land becomes more flat, and there is a tendency towards a stronger clay soil. The land is also more heavily timbered. I am now referring to the region where beans do not grow."

The soil and preparation for bean culture is alluded to by Mr. McKinlay as follows:—

"They succeed best on a sandy loam, with a clay sub-soil, or on a gravel loam with a porous gravel sub-soil, and they must have good drainage. The best mode of preparing land for beans is to plough in the fall, harrow in the spring, and perhaps roll it down and cultivate it with the gang plough. The oftener it is harrowed and cultivated the less trouble there will be with weeds.

"The great object is to get a very mellow seed bed. The best time to plant is from the 5th to the 10th of June, as that gives a long time to work the land. The object is to give the weeds a start and then kill them, so that there will be no trouble with them afterwards.

"The land requires just about the same treatment as for wheat, and if the beans are put in fertile soil, and the land is properly worked, a good crop may be expected. We grow beans on the same land for several successive years, but it is not a good practice. It is wiser to grow in rotation with other crops."

The descriptions grown are, the Marrowfat, a large bean; the Navy, a small bean; and the Medium, which, as its name implies, is of a size between the two previously mentioned, and is the variety most generally grown.

The cost of growing beans, Mr. McKinlay puts at \$14 to \$15 per acre. Of the yield he says:—

"The yield per acre will correspond very nearly with the yield of wheat, that is, from twenty to forty bushels per acre; thirty bushels would be a good average. I have oftener sold beans at \$1.25 than at \$1.50; about 95 cents is as low as they

get. I should think that, for the last ten years, the average would be about \$1.25, which would be \$37.50 per acre at the yield I mentioned."

He adds:—

"I think there is an increasing area under bean cultivation—this year especially. When there is a fine fall, and the people do a lot of ploughing, so that there is plenty of land ready in the spring, they generally plant a good many beans. Wheat doing so well the last few years has had something to do with stimulating the cultivation of beans.

"Ploughing sod in the fall or spring for beans, is the next best thing to summer-fallowing for a wheat crop, and we get the two crops for nearly the labour of one."

The market for beans is largely in the United States, the Michigan lumbermen being among the largest consumers.

The chief casualty from which the bean crop suffers is a wet harvest, which causes discoloration, and consequently a great deterioration in market value of the bean, although not preventing its use for feed.

Mr. McKinlay concluded his evidence on this subject as follows:—

"The straw of the bean makes excellent food for sheep. I have not given my sheep any hay in winter for years; they prefer bean straw to pea straw, I think.

"Beans do not suffer at all from insects or diseases, except, that in very hot weather, if the blossoms are out, they are apt to blight. I have never seen the frost take them in the fall, before they were ripe, but we are in the habit of planting them much earlier than we used to. Those that were planted later produced heavier crops, but there is far more risk in harvesting them. When they get damaged by the weather, we have to hand-pick them, and that is a very tedious job."

Sorghum.

Reference has already been made to the report of Mr. Hilborn, a member of the Commission, on the growth of Sorghum in the States, and the experiments of General Le Due, the Commissioner of Agriculture at Washington on the manufacture of sugar from Indian corn. In regard to the manufacture of sugar and molasses from Sorghum, Mr. McGregor says:—

"We also manufacture a large quantity of sorghum into molasses. The plant grows very successfully with us, and the product is used by farmers' families. Large quantities of it are used in manufacturing apple sauce, or apple butter as they call it. There is not much sold by wholesale, but I believe it would be profitable if it were manufactured on a large scale. One man has five or six acres, and he gets about six barrels of molasses to the acre, or about 300 gallons. It sells at about 50 cents a gallon."

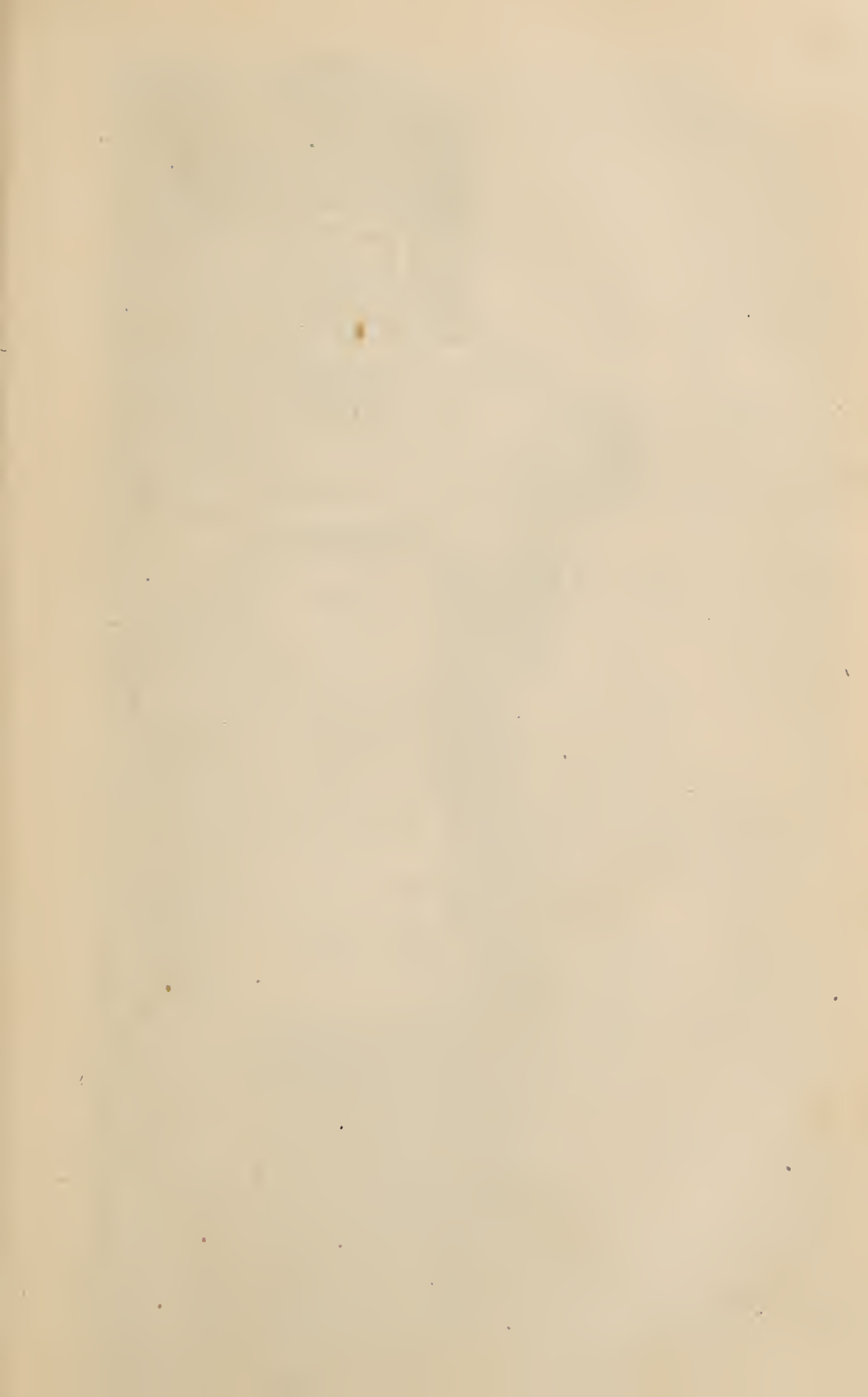
Mr. Alanson Elliott, in his evidence on farming, also alludes to the sorghum crop, and describes the process of manufacture as follows:—

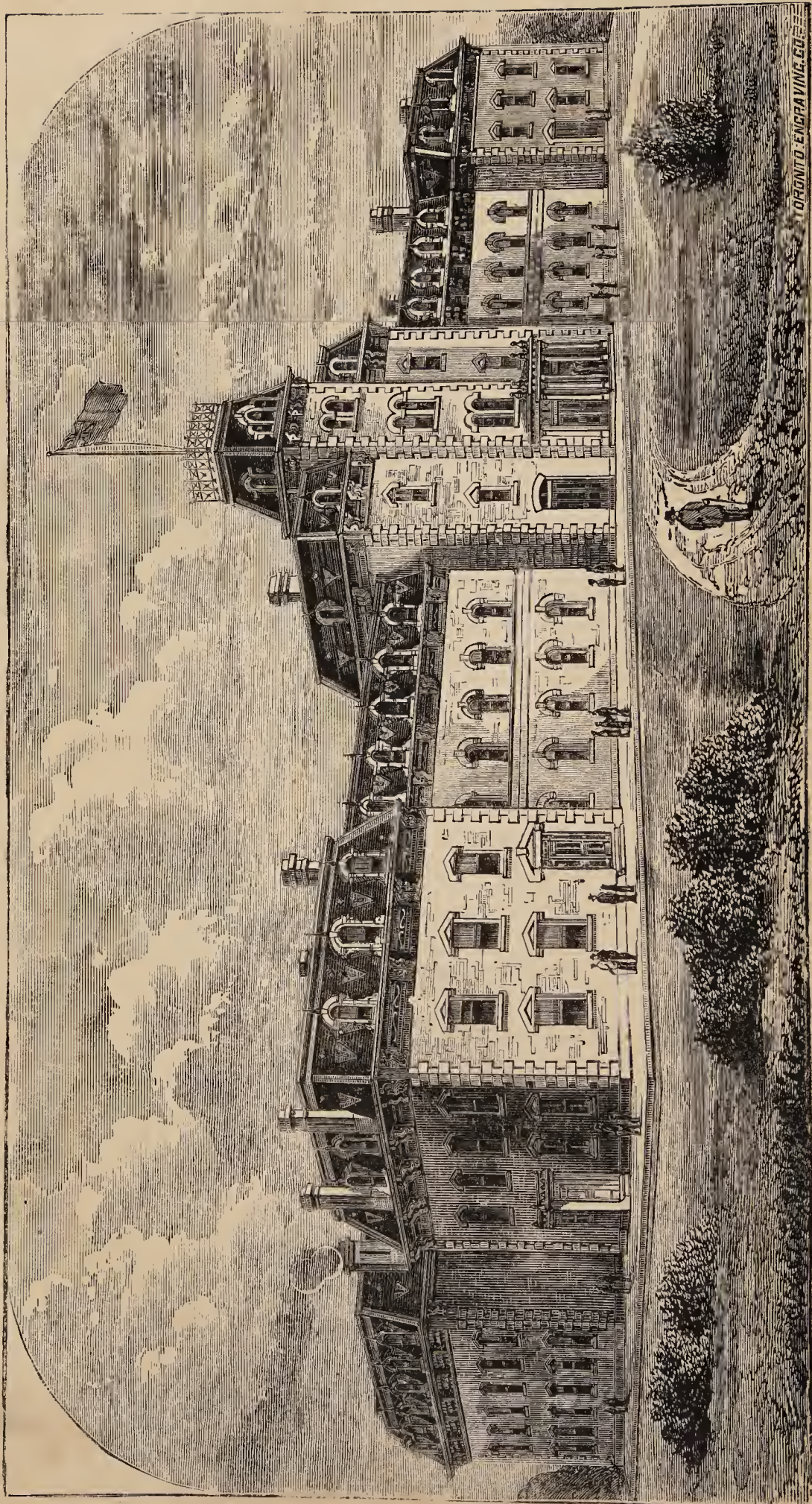
"We cultivate just about enough sorghum for our own use. One man has four or five acres, and he makes it for those around him, charging them 15 cents a gallon. It is raised just about the same as a crop of corn. Sorghum yields from four to six barrels of thirty-two gallons each per acre. The most we have

sold it for is 50 cents per gallon, out of which we pay 15 cents for manufacturing. That would be about \$60 per acre. We consider it a profitable crop to raise, though the demand is not sufficient for us to go into it largely. Our syrup is not as good as the golden syrup, but it is much better than the old West India molasses, and only requires refining to make it of excellent quality.

"We cannot raise wheat after sorghum, because it comes in too late. We sometimes leave the sorghum in the ground till the frost comes, because we find that the quality of the syrup is improved by a slight touch of frost. If we had a certain market at \$40 per acre, it would be grown more largely; if we were selling it to wholesale men the price would be reduced, but it would pay at a wholesale price of even \$30 an acre. We plant corn after a sorghum crop, but we do not plough it in the fall, because it is too late. The roots are a little more compact than corn stubble, but they do not give us any real trouble.

"In the first place the plant is stripped of the leaves, which are left on the ground and fed to cattle; then the seed is cut off and the stalks are put up in piles and hauled to the mill. Some are tied up in bunches. It has the appearance of broom corn more than anything else, and is liable to mix with that plant if they are growing side by side. If growers were content with a smaller profit, I think the market might be extended considerably. Nothing is done with the refuse, at the mill; it is either left to rot or is burnt up. It is said that the amber cane can be manufactured into sugar, and that is an earlier crop than sorghum, though perhaps, a little late to follow it by a wheat crop. We could not raise sorghum so that it would take the place of the better class of syrups."





ONTARIO AGRICULTURAL COLLEGE, GUELPH.

CHAPTER XV.

AGRICULTURAL EDUCATION AND FARM ACCOUNTS.

The subject of agricultural education—doubtless, with the view of the Commissioners making such suggestions as might commend themselves to their judgment in favour of any improvement upon our present efforts in that direction, so far as they have gone, or with regard to the introduction of agricultural study into our public schools, was one of the matters specially referred to, in his Minute to Council, by the Commissioner of Agriculture. Time, however, did not admit of such an examination of this question as would have justified the Commissioners in expressing very decided opinions upon any steps involving important changes, or a large additional expenditure.

The evidence taken, both with regard to agricultural education and farm accounts, will be found in Appendix P, and the Commissioners trust that its circulation in that form, especially amongst the agriculturists of the Province, will give additional vitality to the feeling which has been gradually gaining ground in favour of the necessity for, and improvement of agricultural education. The work accomplished up to the present time in this respect may be pronounced highly satisfactory, although we must regard ourselves as yet but upon the threshold of a grand experiment.

Towards the close of their proceedings only were the Commissioners able to devote time to the examination of witnesses whose evidence it was deemed desirable to obtain in connection with this branch of their inquiry. They then invited the attendance of Mr. James Mills, M.A., President of the Ontario Agricultural College; of Professor Brown, a member of the commission, Professor of Agriculture in the same institution; and of Mr. Wm. Johnston, M.A., Ex-President, Mr. Mill's predecessor.

The two first named gentlemen, by arrangement, confined their remarks chiefly to matters connected with the practical working of the College. Mr. Johnston, on the other hand, dealt largely with the principles and methods of agricultural education generally, for which duty he had been good enough to prepare himself by considerable researches into such materials as were available for the purpose, and by correspondence with a large number of agricultural colleges and institutions, both in the United States and on the Continent of Europe; his acquirements

as a linguist enabling him to perform the latter part of the work with very great efficiency.

The questions that presented themselves for consideration may be roughly stated as follows:—

1st. What is the work done, and how far has the work been successful at the present Agricultural College?

2nd. Is there room for the expansion of that institution, or for the establishment of other schools of agriculture in the Province, and would such a step be desirable?

3rd. Can agricultural education of a primary character be introduced successfully into our public schools?

It may be desirable briefly to refer to the evidence of the three gentlemen named on these several points. President Mills very concisely states the objects of the College to be as follows:—

“The objects of the College and farm together are, first, to give theoretical and practical instruction in husbandry to young men who intend to follow either general mixed farming, stock farming, or gardening; and secondly, to conduct experiments tending to the solution of questions of importance to the farming community, and to publish the results from time to time.”

The system of education carried on is of the most thoroughly practical character, one-half of the students receiving instructions in-doors, while the other half are engaged in the work of the farm.

The study of agriculture is the first and grand object of the curriculum, and everything else is made subsidiary to that idea, no other education being imparted than such as may give increased value and efficiency to agricultural study. For further details in this respect, reference may be made to the evidence itself.

In addition to the regular course of instruction in the College, arrangements are also made for a special course, commencing on the 1st October, and continuing until the 31st March, for the accommodation of those young men who may be engaged upon farms during the summer season, but who still wish to obtain such benefits as may, in their circumstances, be practicable.

The students under this arrangement, perform no manual labour, and the Professors, by doing double work, give them the lectures in addition to the lectures of the regular course, so that anyone taking the term from 10th October to 31st March can have the benefit of the whole year's lectures, and return home to work on the farm early in April. It will be seen that this plan involves a large amount of extra duty on the part of the Professors, which, however, the Commissioners have no doubt, is cheerfully undertaken in view of the benefits that must be derived therefrom by a very large number of young men, who would otherwise be debarred altogether from the advantages of an agricultural education.

Any boy resident in the Province of Ontario, who is able to sign a written declaration that he intends to be a farmer, and who is 15 years of age, is eligible on payment of a \$25 fee annually, for admission to the College, on the same terms, as to educational requirements, as those upon which he could gain admittance to any of the High Schools. While precedence is given to residents of Ontario, the advantages of the institution are open, on payment of a small additional fee, to the sons of persons resident elsewhere. The students are paid for the work they perform, according to its value, at the rate of from five to ten cents per hour, the amount thus earned being credited to their board.

The expenses are as follows:—Tuition fee, for ratepayers and *bona fide* residents of the Province of Ontario, \$25 a year; for non-residents, \$50 a year. Board and washing charged at cost—about \$2.25 a week. Every student is paid for his work at the rate of from five to ten cents an hour, and the amount thus earned is credited on his board account, so that the entire outlay for tuition, board and washing is from \$35 to \$50 a year to an Ontario farmer's son who understands ordinary farm work; from \$45 to \$65 a year to an Ontario boy who has not been trained to work on the farm—such boys as come from the cities of the Province; and from \$65 to \$85 a year to a non-resident.

Notwithstanding the novelty of the experiment, so far as Ontario is concerned, and of the difficulties incidental to a new undertaking, the applications for admission exceed the accommodation at the command of the institution. Extensions to the building have been recently made, and 132 students are now in residence, with many more anxious to obtain admission as opportunities occur.

“One hundred and fifty,” says Mr. Mills, “is the largest number we could accommodate under the present arrangements.” Not a few of the students at college are from the cities and towns, young men generally of fair education, the sons of persons with some means, who desire to qualify themselves for farming on intelligent principles, with such aids as capital may afford. More than this, Mr. Mills has the satisfaction of knowing that many farmers, whose elder sons took the college course, are now sending their younger sons to enjoy the advantages of the institution, and expressing their pleasure at observing the largely increased interest which a knowledge of scientific principles and methods of agriculture have given their elder sons in the business of farming.

Mr. Mills mentions, too, on the authority of Mr. Dyke, Dominion Emigration Agent at Liverpool, that the college could be filled, if it were desirable, with young men from Great Britain, willing to pay \$400 or \$500 a year; and, while no idea would probably be entertained of giving the benefits of the college to persons from abroad, to the exclusion of Canadians, it is evident that, to open the way for young men of education and capital from the mother country, to establish themselves as farmers in Canada, would be to promote immigration of the most valuable and acceptable character.

It is not pretended, however favourable the progress hitherto has been, that

the Agricultural college is perfect in all its arrangements and appliances, and some matters that more or less urgently need attention were pointed out by the President.

The first of these is a thoroughly well-furnished laboratory. The room used for that purpose at present, as Mr. Mills very rightly remarks, is hardly worthy of the name. It will accommodate only two or three students at a time; is about 8 by 12 feet in size; was never intended for a laboratory; and, of course, in such an apartment, anything like teaching or even conducting experiments efficiently is quite out of the question.

Every intelligent person knows that the teaching of Agricultural chemistry to be of any value at all, must be practical, and the various operations of the chemist must not only be orally described, but they must be worked out in detail and demonstrated in the presence of, or by the students.

Education in chemistry without sufficient appliances to admit of this being done is almost a farce. The cost of a properly furnished laboratory would be, Mr. Mills thinks, about \$12,000. He mentions, incidentally, that the one at the Agricultural College, at Lansing, in Michigan, without apparatus, cost \$10,000. If a proper laboratory were erected, with suitable apparatus, not only might the students receive instruction in chemistry, but analyses of soils and other investigations of interest, both to individuals and to the Province at large, might be conducted by the professor with the aid, and greatly to the advantage of students.

The professor of chemistry, Mr. Panton, is believed by the Commissioners to be an able and competent man, who only requires ordinary means to achieve all that can be expected of him. This subject has, probably, already received the attention of the Government, and the Commissioners hope that the increasing interest felt in the institution will justify its further liberal consideration. In addition to the laboratory, a well stocked library is also an essential to such an institution, the present library being limited to a very few volumes.

Another point referred to by President Mills, was the shortness of the course (two years), giving as it does too little time for the acquirement of proficiency in agricultural studies, particularly where the student has no previous knowledge of the profession. This is one of those matters upon which the Commissioners would not desire to express a decided opinion, unless they had the opportunity of considering the point much more thoroughly than they have been able to do at the present time.

The advantage of adding blacksmithing to other matters in which instruction is given is obvious, it being almost as important for the farmer to know how to perform simple operations in the working and manufacture of iron, as in those of wood. The expense of a small portable forge is, it is said, only about \$25.00. It is possible, therefore, that something in this direction might be done with advantage, and at a very trifling cost.

Scarcely less necessary than a laboratory, or library, is a museum. Mr. Mills says on this subject:—

“A museum at the College is much needed. We have quite a collection of insects, entomological and geological specimens, but no place to keep them. I am safe in saying we have \$500 or \$600 worth of specimens going to waste for want of a museum. The teaching of these branches must be imperfect, so long as we are without such a museum. The students are encouraged to make collections of specimens, and they have done a good deal at it this year. I would not say that entomology could not be taught efficiently without having a museum of the kind I speak of, but I think it could be taught much better if we had one to put the specimens in.”

Prof. Brown, while generally coinciding with his colleague in the suggestions made with regard to the deficiencies which have yet to be supplied, also urged the importance of the appointment of a professor of horticulture and botany. Perhaps if the term naturalist were employed it would cover a larger ground, including, as it then would, entomology and ornithology, which might be usefully combined with the studies of arboriculture or horticulture. At present the only instruction in entomology is given by the Professor of Chemistry from a text-book.

The want of text books is also strongly commented upon by Professor Brown. “I think,” says Professor Brown, “that a set of text books is absolutely necessary. If I am lecturing on any special department, I would like to place a hand-book on that subject in the hands of the student;” and then he gives the following list of text-books as those which he proposes should be compiled primarily for the use of the College, but also for the benefit of our whole agricultural population.

- 1.—The Cultivation of Grain Crops.
- 2.—The Cultivation of Pastures and Green Fodders.
- 3.—The Cultivation of Root Crops.
- 4.—The Garden and its Crops.
- 5.—The Growing of Fruit.
- 6.—The Cultivation of Trees.
- 7.—The Botany of the Farm.
- 8.—The Chemistry of the Farm.
- 9.—Soils and Geology.
- 10.—The Mechanics of the Farm.
- 11.—Road and Fence-making.
- 12.—Farm Drainage.
- 13.—Physiology and Diseases of Farm Animals.
- 14.—Insects injurious and beneficial to Farm Crops.
- 15.—Manures.
- 16.—Food and the Fattening of Farm Animals.
- 17.—Cattle and their Management.
- 18.—Sheep and their Management.
- 19.—Horses and their Management.
- 20.—Swine and their Management.
- 21.—Poultry and their Management.
- 22.—Bees and their Management.
- 23.—Management of the Dairy, and the making of Butter and Cheese.
- 24.—Agricultural Mathematics and Book-keeping.

The need for text-books has been mentioned in connection with other branches of the Commissioners' enquiry.

Among the recommendations made by Mr. Brown were, that more time should be allowed for the practical instruction of students, and more opportunities given to impress the lectures of the class-room. The construction of model labourers' cottages and a model farmer's residence, were mentioned as matters which it was desirable to bring to the notice of the Government. Mr. Brown also favours the idea that, by offering a limited portion, say, one-fifth of the accommodation afforded by the College to students from Europe, at a fee, say, of \$250 a year, a desirable class would be attracted to Canada, and the College would thus become, as already suggested, a most valuable immigration agency.

In addition to the text books before alluded to, Mr. Brown recommends the publication of a first-class agricultural periodical, on which point, it may here be remarked, that nothing worthy of a great agricultural country in the shape of such a publication at present exists in Ontario.

The introduction of agricultural text-books into the public schools, and the extension of the prize-farm system lately adopted by the Agricultural and Arts Association of Ontario, are also recommended by the Professor.

Mr. Johnson, in the course of his evidence, glanced at almost every branch of the subject of agricultural education. He discussed, at length, the need of agricultural education and the methods by which it may be imparted. The relations of the State to this branch of study, the subjects to be taught, and the appliances requisite for teaching them were referred to, exhaustively, as well as the condition of agricultural education in Great Britain and Ireland, in a dozen other European countries, and in the United States. He then proceeded to sketch an outline of what, in his opinion, should be the system of agricultural education in the Province of Ontario, finding in the information already referred to, and in the steps already taken here, precedents for his various suggestions.

The general arrangements for an Ontario agricultural college and model farm were also outlined, reference being made to the history and progress of the present institution, and a plan was proposed for its permanent endowment and organization. He concluded his remarks with an allusion to experimental agricultural stations, and some other interesting matters of a cognate character.

To be fully understood and appreciated, Mr. Johnson's observations must be perused in detail, and the Commissioners hope that his evidence and that of the two other gentlemen examined in this branch of their inquiry, will have a wide circulation among the people of the Province. They believe it will tend to place the subject of agricultural education in a broader and clearer light and create further interest in the public mind in regard to this most important subject.

Further than this, the Commissioners will not be expected to do more at the present time than to endorse the recommendations and suggestions already alluded to, which are of an immediate and directly practical character.

It may be noticed, however, that both Mr. Mills and Mr. Johnston advocate the extension of our system of agricultural education beyond its present limits, by introducing it into our public schools, and by establishing agricultural schools in the counties, or as suggested by Mr. Johnston, by arranging for prize farms, to be recommended by the county agricultural societies, whose proprietors may be willing to receive pupils to work on the farm; the pupils to pass regular examinations on specified practical subjects, conducted by teachers and examiners of the Provincial Agricultural College, semi-annually. Mr. Mills, while recommending the establishment of agricultural schools, does not go so far as to recommend that they should be connected with a farm and its appliances. Mr. Johnston, on the other hand, would place them in the position of the farm schools of France, and make them thoroughly practical in their character.

The time may come when these views will receive endorsement from the government and people of the country. They are now merely presented as the suggestions of able and competent men, who are known to take the warmest interest in the subject of agricultural education. It is a very noticeable fact, that, however gratifying the work done by our high schools and collegiate institutes, the system of education pursued there, necessarily tends to wean the student from an attachment to the business of agriculture. In other words, they are, perhaps unavoidably, just so many institutions tending to disincline farmers' sons to the avocation of their fathers. It is not thought by any of the witnesses to be practicable to teach agriculture in our high schools, nor is agriculture successfully taught in connection with the higher branches of study elsewhere, although, in public schools the introduction of a text-book on agriculture might perhaps be attended with little difficulty or inconvenience. Great indeed will be the advantage to Ontario if any means can be devised to correct the growing disposition of the rising population of our agricultural districts to forsake rural life, for pursuits, already overcrowded, in towns and cities, and it may be, ultimately disgusted, or disappointed, to quit their native country for another.

Apropos of the subject of text-books, it may here be mentioned, that, during his recent visit to Washington, Mr. Hilborn, one of the Commissioners, whose report appears in Appendix S, met with a gentleman who had carried through the State Legislature of Tennessee, a Bill under which the study of agriculture had been introduced into the public schools of that State. Mr. Hilborn has since forwarded a copy of a small text-book published by Messrs. Appleton & Co., of New York, which is used in the Tennessee schools. The Commissioners have had no opportunity, collectively, of examining the book, but it appears to be a useful, practical, and very complete little volume. It will also be noticed from the evidence, that agricultural text-books are used in the agricultural schools of Ireland. With such models as these it ought not to be difficult to compile a text-book adapted to the wants of Canadian rural public schools.

FARM ACCOUNTS.

From the information orally communicated and replies to printed questions, it is evident that very few farmers keep accounts at all, that a limited number do so in some primitive method or other, and that here and there one has adopted a system approximately accurate in showing his profits or losses. The Commissioners well understand the reason for farmers differing in this respect from other persons in business. Some of them, like Mr. Gibson, of Markham, pay cash for everything, and as they give, as a rule, no credit, they look on all they have knowing it to be their own, and are content. They find themselves better off at the end than the beginning of the year, and don't think it matters much by what particular process or branch of their business the accrual of property or money has been achieved. To go into the question as between this field and that field, this crop and that crop, this operation and that operation, would be a work of time and labour, and so is given up. No doubt a simple cash account is kept by many, and banking facilities have of late years led to the keeping of bank current or deposit accounts, against which large payments are checked out. Still it would be most desirable if some method could be devised, not too troublesome, and showing the farmer how he could dissect his expenditure and place both that and his receipts under proper heads. Enough has been divulged in the course of the evidence to show that farmers are far too ignorant for their own good of what they may be losing or gaining, while it is clear that many, by losing in one way what they make in another, are, as Mr. Hall would say, "putting it in at the spigot to run out at the bung-hole." The Commissioners have taken some evidence on this subject, and, in Appendix P, are forms of accounts suggested by the witnesses. Professor Brown says:—

"I think the book-keeping of an average farmer could be done in one form. If you complicate the system you fail. From my own experience in England and Scotland, and the management of a large number of farms, I would recommend a simple journal with three days to the page, and double money columns, as a farm journal and ledger, in which the farmer could every evening note down for example where the man has been ploughing for a certain crop, etc., and that all his notes should be made up once a month in spaces left for that purpose between each month, so that at the end of the year he would only have to sum up the twelve pages and classify. I have been able to keep such a book with my own work. My plan would be as follows:—

- I.—Household.
- II.—Horse Labour.
- III.—Manual labour paid for.
- IV.—Manual labour not paid for.
- V.—Permanent improvements (capital account).
- VI.—Rates and taxes.
- VII.—Crops laid down and harvested.
- VIII.—Sales.
- Inventory and valuation.

Mr. J. W. Johnson, Principal of the Ontario Commercial College, Belleville, has devised a system which, he states, his pupils—largely farmers' sons—have effectively carried out in connection with their fathers' farms. Mr. Ketcham Graham and Professor Bell both spoke favourably of Mr. Johnson's plan of accounts. Mr. Johnson says:—

"I have endeavoured to frame a system of accounts for farmers. I have found it easy to do this. I have never lived on a farm nor had any practical knowledge of its working. The system is by double entry. The plan is to start with an inventory of assets and liabilities. In one book we have on one side the Day Book, in which is recorded every transaction as it occurs, and on the other side the Journal, where the entries are prepared for the Ledger; as for instance:—

DAY BOOK.	JOURNAL.
Paid cash for seed, as under, Fields Nos 1 and 2, 32 bushels, at 75c. per bushel.... \$24 00 Field No. 3, 16 bushels, at \$1.00 per bushel.. 16 00 Field No. 4, 8 bushels, at 50c. per bushel... 4 00 Field No. 5, corn and potatoes..... 5 00 <div style="text-align: right;">\$49 00</div>	Fields Nos. 1 and 2 Dr..... \$24 00 Field No. 3 "..... 16 00 " No. 4 "..... 4 00 " No. 5 "..... 5 00 <div style="text-align: right;">To Cash..... \$49 00</div>

"We are supposed to have a farm of fifty acres, divided into seven fields and one orchard. The object is to ascertain what the gain and loss may be from each crop, from the stock and other operations, and household expenses. We open an account in the ledger with each of the fields, or where the same crop is sown in two fields, we combine them in one account, and charge on the crop costs for seed and labour, and give it credit for all it produces, thus ascertaining the net gain or loss from each crop.

"At the end of the year a balance sheet is taken off and we ascertain the loss and gain from various accounts, close these up for loss and gain account, and take an inventory of the property, and the balances, showing assets and liabilities, are brought down for use in the succeeding year. We make every year carry its own profit and loss irrespective of the effect of its operations on future years."

The forms in which this plan is worked out will speak for themselves. It is evident that they are mainly intended for the use of those who have had the benefit of some such training as Mr. Johnson's college offers.

Mr. Alexander Mactavish, the Mathematical Master of the Ontario Agricultural College and Model Farm, has also favoured the Commissioners with a plan of farm accounts. Mr. Mactavish stated that he had in preparation a plan of farm book-keeping, under the title of "Experimental Accounts," intended to show the results of the separate operations on a farm during the year. The plan submitted however, is designed as a guide to the ordinary farmer, whose opportunities for maintaining a more elaborate system of book-keeping are limited.

The system is a much simpler one than Mr. Johnson's, although it is not pretended that it shall be so complete or effective as one designed on more elaborate principles.

It will be found very clearly and intelligibly explained in the evidence in Appendix S, with forms attached.

Some very sensible and practical remarks made by Mr. Hugh McDiarmid, of Lodi, in answer to questions submitted to him on this subject, may also be worth reproducing here. He says:—

“1. Any complicated system of keeping accounts deters farmers from having a correct record of their receipts and expenditure; should a day-book be kept, posting will be apt to fall in arrears and at last be given up as a ‘bad job.’

“For the average farmer there should only be one book having one page for ‘Receipts,’ and the opposite for ‘Expenditure,’ or headed ‘Received,’ and ‘Paid Out,’ and a portion allotted to ‘Debts due to him’ and ‘Debts owed by him.’ The accounts should be balanced monthly. The terms usually employed in book-keeping should be sparingly used, such as ‘Debit, Credit, Bills Receivable and Payable,’ etc.

“Attempts made to keep separate accounts of the cost and what realized of the various products of the farms will only lead to confusion. These, when required, can be picked out of the general account.

“Attention should be directed to the keeping of an estimate of the value of the work performed by the family in addition to that for which a consideration has been given, together with the cost of such of the products of the farm and dairy as may be used for the support of the family and servants, also that used for the feeding of domestic animals.

“2. Single entry should by all means be adopted.

“3. I have never known a farmer to take stock annually, and have no doubt but that it would be the means of removing a good deal of groundless anxiety, as farmers are apt to take a contracted view of their standing. The advantages, however, to be derived from following the course indicated by giving him an idea of his present worth, are that he may be able to expend more in needed improvements, or curtail his expenses. Besides, by comparison of the state of his accounts for several years, he should be in possession of sufficient data to enable him to know what branch of his calling will be the most profitable to follow.”

Leaving the evidence to speak for itself, and the several propositions to the examination of those for whose benefit they are intended, the Commissioners strongly urge on the farmers of Ontario the importance of, at all events, making the nearest approach to an exact account they find to be practicable. A cash account of money received and paid is simple enough. An annual valuation or stock-taking should not be difficult, and will be most valuable. These may be termed the exact calculations of the farmer. In addition to this if a rough memorandum be kept of each separate transaction, connected with the crops or the herd, it will enable farmers—not to present a regular balance sheet, but—to figure out for their own satisfaction results concerning which they, to a large extent, are often ignorant. In this way many will devise for themselves plans and methods that they, at all events, will understand for themselves and greatly profit by.

CHAPTER XVI.

METEOROLOGY.

The subject of meteorology, as it affects the interest of the agriculturist, was brought prominently before the notice of the Commissioners at one of their meetings by Mr. Thomas H. Monk, a young but able member of the staff of the Dominion Meteorological Service Bureau stationed at Toronto. At the request of the Commissioners, Mr. Monk made a statement in which he reviewed the whole question of meteorology and meteorological observations in connection with agriculture, and subsequently appended to his evidence a report, together with a meteorological Province map, showing the proportions of the rainfall as near as they can be ascertained in the different sections of the country. Mr. Monk's evidence and the evidence of Mr. J. Gordon Mowat, of Galt, better known as "Moses Oates," the weather prophet, form the contents of Appendix Q.

Mr. Monk, in his statement, discussed the climatic conditions of the Province; the effect of the great lakes on rainfall, snowfall, and temperature; the effect of clearing the forests on rain and snow fall and streams; the relation of meteorology to the daily operations of the agriculturist and fruit grower; the manner in which meteorological observations of a simple character may be conducted, and the possibility of providing machinery throughout the Province, by which periodical reports may be obtained.

At the present time the observations of the department with which Mr. Monk is connected have reference solely to the conditions of weather, and the progress or direction of storm currents, with a view mainly of serving the interests of the mercantile marine. The Government of Canada, of which the meteorological service is a department, does not pretend to take cognizance of the effects of meteorological phenomena on the crops or the soil.

The subject is an entirely new one to most persons, and time must necessarily elapse before its importance comes to be fully felt and appreciated. It may be stated, however, that no insuperable difficulty appears to exist in the way of obtaining returns of rainfall or temperature. The instruments provided for this purpose are not very expensive, and there are few districts in which persons of sufficient intelligence might not be found to keep a daily register and transmit it on a printed form to the proper quarter. But, to make such experiments really use-

ful, compilation and classification would be necessary, and the inferences drawn from them must be issued under proper care and supervision for the benefit of the agriculturist. Such information is collected and highly valued in some other countries.

In Denmark rain stations are situate at distances of every ten or eleven miles. At Lansing, Michigan, special attention is paid to taking observations of the weather with a similar object.

In Germany there is a general meteorological system, while special investigations of the class indicated are carried on in Bavaria, Prussia and other parts of the empire.

In Austria, in Switzerland, Sweden and Norway, and in England, the science of meteorology has made great advances, and receives every assistance from the Government, while its importance is beginning to be thoroughly understood by most classes of the people.

France is probably in advance of other countries with respect to progress in agricultural climatology. In 1877, Mr. Monk states, France had 1,200 stations established to enable her people to study the influence of the weather on agriculture.

In the United States farmers' bulletins are issued every month on which the kind of weather that may be looked for in different localities when the wind is from a certain direction is stated.

These facts sufficiently show the importance attached to the subject by countries most advanced in scientific knowledge, and most keenly alive to the interests of agricultural industry.

The Commissioners present the evidence referred to, trusting that the importance of the matter to which it refers may cause it to receive the consideration to which it is entitled, and it will give them much pleasure to observe that information so interesting as that afforded by the gentlemen named, has created an increased interest in meteorological study, and led to greater attention being paid thereto at the Agricultural College and other educational institutions. It will be, of course, for the Government to consider, both on the score of expense and practicability, whether the suggestions made for an extended system of regular meteorological observations can, at the present time, be entertained.

CHAPTER XVII.

MUSKOKA, PARRY SOUND AND MANITOULIN.

Muskoka and Parry Sound.

While the older settled portions of the Province naturally demanded the largest share of attention from an Agricultural Commission, it was obviously proper that some of the newer and outlying sections should not be altogether overlooked. Having regard to the circumstances generally under which the electoral district of Muskoka and Parry Sound had been settled, it was thought most expedient that some members of the Commission should make a personal visit to that district, and thus obtain, not only from oral testimony, but also by personal observation, a much larger amount of information than could be had by summoning a limited number of the settlers to give evidence at Toronto.

Accordingly, in the month of August, Messrs. William Brown, Edward Stock and A. H. Dymond proceeded to Muskoka and held a series of sittings at some of the most convenient centres. The trip occupied eleven days and extended over some 200 miles within the electoral district.

Nine sittings were held, fifty witnesses examined, and twenty-seven townships were directly represented, while many of the witnesses were able to speak from personal knowledge, of townships other than those with which they were actually identified.

The whole evidence, as taken down by the shorthand writer who accompanied the Commissioners, will be found in Appendix R; but the visiting Commissioners felt it their duty, not merely to receive and present the evidence, but also to make a report embodying the salient points of that evidence and such remarks as their observations during the journey suggested. (*See also Appendix R.*)

Hitherto the District of Muskoka has been looked upon almost exclusively as a lumbering region and a territory appropriated to Free Grant settlers.

The Free Grant Act was passed in the year 1868, and, at the present time, it is supposed the population of the district does not number less than 30,000 souls.

The lumbering industry is carried on to a considerable extent, several townships having been placed under license from 1871 up to the present time. A large proportion of the settlers have been, as may be supposed, persons without means, or with very limited means indeed.

The Commissioners remark upon this fact, and point out that the general effect of the Free Grant policy has necessarily been to people Muskoka to a very great extent in the way least likely early to show large results. The country is densely wooded; consequently, every foot of cultivable ground has had to be cleared with the axe; and, but for the lumbering industry, already referred to, not a few of the settlers would have found subsistence impossible. Having regard in fact to the nature of the country, and the class to which the majority of the settlers belong, the progress made has been not only satisfactory but even, in some respects, surprising. The district is traversed throughout by bands of Laurentian rock, and the cultivable area is thereby considerably broken up. The Commissioners, in their report, make a somewhat exhaustive analysis of the evidence on this point, the result of which is given in the following paragraph:—

“That, while the prevalence of rock is in a great many places too profusely manifested, and in others, if not so plentiful, quite sufficiently intrusive, is admitted by all. But, while this diminishes the actual amount of the cultivated area, it does not seriously interfere with, or impair, the cultivation of the portion clear of rock. Moreover, as a perusal of the evidence shows, some of the roughest portions are well adapted for pasture. No doubt exists in the minds of the Commissioners that, while in the area of country visited, there is a fair proportion of agricultural land, it is to be found in larger quantities, and of a superior quality, in many of the more northerly townships at present but little known. At a short distance to the south, south-east and south-west of Lake Nipissing, a district very favourable for settlement undoubtedly exists. It has been the object of the Commissioners to discover, as far as they are able, to what uses a district of this character can be most profitably applied, and for what branches of agriculture it is best adapted. It may be well, however, to notice in the first place, one matter in connection with the soil and its productiveness, to which attention was more than once directed during the inquiry.”

The absence of fossiliferous limestone deposits is then noticed as a somewhat serious drawback in connection with agriculture in the district. This, however, will in time be more or less overcome as the country is opened by railway communications, settlers being in that way enabled to obtain lime and other fertilizers, at a short distance from either the southern or northern boundary of the district. It appears, too, that, more particularly on the western side of the district, there are some extensive deposits of crystalline limestone, which are certainly of economic importance, and supply lime for mechanical purposes, which is described as being of superior quality. The Commissioners, after noticing these deposits, and quoting from various sources of information with respect thereto, suggest that, in view of the demand for lime for so many mechanical purposes, especial attention should be given to these deposits in order that their actual practical value may be correctly ascertained.

The Commissioners discuss very fully, in their report, the capacity of the district for raising wheat and other cereals. As respects wheat, after quoting voluminously from the evidence, they say:—

“The conclusion is arrived at, that wheat-growing to the extent of supplying

the local demand in Muskoka should be encouraged, wherever it can be conducted with reasonable success.

"In Muskoka the stumps still dot the ground, manure is scarcely applied, drainage is practically unknown, and, from the first operation of breaking up the soil to the final harvesting of the crop, many of the simplest essentials to success are wanting. Yet, in face of all this, many good crops of wheat have been raised, and, in the opinion of the undersigned, only proper management of the land is necessary to enable the settlers of Muskoka profitably to grow all the wheat needed for their home consumption."

For coarse grains, the district appears to be remarkably well adapted, oats, barley and peas being generally very fine, and in some cases superior to those seen in the older counties. Indian corn is grown to a somewhat considerable extent, and, although in some situations cut off by frost, is found to be a tolerably profitable and successful crop. On high and open land, or near the water, the summer frosts are not injurious, although in other places their effects have been fatal to the crop.

Summing up the evidence as to the growing of Indian corn, the Commissioners arrive at the conclusion,

"1st. That Indian corn must be regarded as one of the natural productions of the district.

"2nd. That, in certain situations or where no exceptionally unfavourable event (such as frost in August) occurs, it may be grown successfully.

"3rd. That, having regard to the value of the crop either in a green state for fodder, or, if harvested, both as fodder for cattle and food for man, as well as its beneficial effects as an agent in the clearing and cultivation of the soil, the planting of Indian corn in the district may be properly encouraged, always provided the places for its cultivation, on any considerable scale, be selected with the view of providing, as far as practicable, against the effects of such casualties as those above referred to."

For root crops, the soil of Muskoka seems in many places to be particularly well adapted, while all the ordinary garden vegetables are cultivated successfully.

As mentioned in the earlier portion of this Report, the wild grape is not found in Muskoka, but the cultivated grape has been introduced with satisfactory results. The hardier descriptions of apples are being cultivated, while the crab bears luxuriantly, and the plum, with all the smaller fruits, can be profitably grown. The latter and the wild plum are found in all parts of the district in enormous quantities. What seems, however, to have struck the Commissioners as most favourable in connection with agricultural settlement in Muskoka was the capacity of the soil for maintaining permanent pastures, many of which had been seeded down as long as ten years previously to the Commissioners' visit, and were still yielding a heavy annual crop.

The practice of those settlers, who are not forced by circumstances to adopt any other course is, in clearing the land, to seed down with the first or second grain crop, and then to leave the land in grass until the stumps have rotted away. This system is exceedingly well adapted to the nature of the country

and to agriculture in its earlier stages of development, while the price paid for hay by lumbermen has been very remunerative to the early settler. As lumbering, however, recedes, the market for hay and coarse grains becomes, consequently, less accessible, and the settlers have had to consider in what direction they can profitably turn their energies with a view to the future.

It fortunately happens that, in addition to the poorer class of persons already referred to, several men possessing more or less capital have taken up land in the district and have thus infused a spirit of progress and energy into its somewhat primitive style of agriculture, and a very fair representation of improved stock is to be found in many places. The bush pasture has been a useful auxiliary in connection with the maintenance of stock during the earlier summer months, while the hay of the beaver meadow has provided a means of supporting the cattle during the winter season.

From the broken nature of the country it is evident that stock raising or sheep farming would be the most convenient branches of industry the settlers could adopt, for, although the district is well adapted in some respects for cheese and butter making, the comparative sparseness of the population, and difficulty of keeping up regular and frequent communications are drawbacks to the formation of those co-operative associations by which such industries can be most profitably carried on. The climate is extremely healthy, and the supply of fresh water in the shape of lakes, creeks and rivers, is unlimited, the whole country in fact being intersected by water highways. Looking at the capacity of the district from a purely agricultural point of view, and leaving entirely out of consideration all those questions of policy connected with the Free Grant system which apply thereto, the visiting Commissioners appear to have come to the conclusion that, as a stock-raising and sheep-farming region, the District of Muskoka must in the future chiefly be regarded. The want of a supply of hardy young stock is admitted to be felt by the farmers and feeders of cattle for market in the front counties, and the Commissioners see no reason why persons possessing capital and experience should not, in Muskoka, find stock raising a profitable industry.

Coupled with the suggestion that the attention of the Government should be directed to this matter with the view of affording facilities for the class of settlers or occupiers of the land, indicated, the Commissioners desire at the same time respectfully to urge that the preservation of the more valuable hardwood timber of our still remaining Crown lands should be the subject of special and particular attention. In the District of Muskoka and Parry Sound large quantities of such timber exist, and every day brings nearer the time when, either from its possession or destruction, its real value will be recognized.

The water communications existing, supplemented by colonization roads already constructed, and still more by the projected railway through the length and very heart of the district, will afford means for marketing its products or shipping them to market at many convenient points, and of rendering the hard-

wood timber accessible with little difficulty. Nor can the Commissioners overlook the fact, that, if the lands of the Muskoka and Parry Sound District can be made available for the purpose already as above proposed, a key may be found to the solution of the question what is to be done with regions still more remote and to all appearance unfitted for settlement in the ordinary sense, but still within the boundaries of Ontario. The subject is too large to be touched upon further here, but it is one well worthy of the attention of all who have the future of this Province most nearly at heart.

Manitoulin and Sault Ste. Marie.

In the course of the summer Mr. William Saunders, one of the Commissioners, having occasion to spend some time in Manitoulin Island and the surrounding district, took the opportunity of obtaining such information as to its resources, as was within his reach, and, at his return, embodied it in a report. Of the Grand Manitoulin, Mr. Saunders says:—

“The Grand Manitoulin Island, which is included in the District of Algoma, separates the waters of the north channel west of the Georgian Bay from Lake Huron. It is nearly 100 miles in length, and varies in width from about forty miles in the widest part to about two and a half miles at its narrowest portion at the base of Elizabeth Bay. It contains about a million acres, fully one-third of which is suitable for general agricultural purposes, about another third adapted for stock raising, or dairy or sheep farming, while the remaining portion consists either of bare rock, or of rock covered with soil so shallow as to prevent its being of any practical value. Occasionally a long stretch of this barren, rocky land is met with, but, more frequently, the rocks run along in ridges, often near the shores of the island, giving it, in some places, a sterile and uninviting aspect. Frequently it will be found that a farm of 100 acres in such a situation, with a broken, rocky front, will contain from 50 to 75 acres of good land. The island is entirely a limestone formation, and a striking feature in its geography is the numerous deep bays indenting its outline, chiefly along the northern side, and the numerous lakes, large and small, scattered through the interior. The largest of these lakes is Lake Manitou, which is eleven miles in length and seven in width at the widest part. From the larger lakes flow rivers of sufficient volume and power to supply a number of mills. No mountains occur on the Manitoulin Island, but the surface presents a series of elevated plateaux, with their abrupt edges facing northward. The Niagara, Hudson River, Trenton, and Guelph formations are all found here, and many of the interesting fossils peculiar to these groups are met with in some localities in great abundance. On the northern side vast numbers of granite boulders have been transported from the north shore, and deposited, frequently forming a serious obstacle to agriculture.”

Manitoulin Island is Indian territory, the wild lands being sold by the Dominion Government, for the benefit of the Indians, to whom it stands in the relation of trustee. As no improvements would be undertaken by the Dominion Government, except in view of benefiting the Indians' estate, the conditions of settlement are not the most favourable, but nevertheless, in some eight or ten years Manitoulin has, in addition to the Indians on their respective reserves, received a popula-

tion now supposed to amount to some 15,000 souls. Of the soil, Mr. Saunders says:—

“The soil varies much in character, from a rather stiff clay loam to a light, sandy loam, very fertile, producing, in favourable seasons, good crops of wheat, oats, peas, barley, corn, and excellent root crops.”

A fair average crop of spring wheat—beyond the average, in fact, of the yield in the older-settled portions of the Province—a very good yield of barley, and a large yield of oats, are obtained by the settlers from land that is still in process of clearing and encumbered with stumps. Corn does well and is seldom affected by spring frosts. Hay crops are also large. Of roots, Mr. Saunders says:—

“Root crops do remarkably well. On one occasion, Mr. Willet, a settler, dug 380 bushels of potatoes from seven bushels of seed. Early Rose is the most popular variety, but several others are also grown; the average crop is about 150 bushels to the acre. A long black beetle, a species of blistering beetle, which devours the leaves, is usually common, and sometimes abundant; occasionally it eats the stalks almost bare, yet no serious injury to the crop, from this cause, has been observed. The Colorado potato beetle has appeared, but has not yet increased to a sufficient extent to excite alarm.”

Turnips here yield as much as 750 bushels to a stumpy acre. The pea bug has not yet made its appearance, and Mr. Saunders’ suggestion to the effect that Manitoulin may provide a supply of uninfested seed peas has already been noticed.

Fruit cultivation has been too recently introduced to enable much to be said of actual results. As a subject in which Mr. Saunders takes especial interest, he naturally gives it rather particular attention. He suggests the following as the varieties of the several fruits likely to succeed in the islands and adjacent districts:—

“APPLES.—Early varieties—Tetofsky, Red Astrachan, Duchess of Oldenburg. Later sorts—Fameuse or Snow Apple, Wealthy, Ben Davis, Grimes’ Golden, Pomme Grise, and Golden Russet.

“CRAB APPLES.—Transcendant and Hyslop.

“PEARS.—Clapp’s Favourite, Tyson, Flemish Beauty, Seckel and Lawrence.

“PLUMS.—Lombard, Imperial Gage, Yellow Egg, Pond’s Seedling and Yellow Gage.

“GRAPES.—Champion, Moore’s Early, Concord, Clinton, Delaware, and probably Rogers’ No. 4 (Wilder) and No. 15 (Agawam).

“The small fruits are usually so well protected by snow during the winter that almost every variety would be likely to succeed.”

Mr. Saunders is led to submit this list largely in consequence of the importance of a proper selection being made of fruits suited to the soil and climate, rather than those pressed upon the settlers by pedlars and others, whose sole desire it is to sell what they have to dispose of. He says:—

“I learned that the indomitable tree pedlar had found his way years ago into these comparatively remote sections, and with the aid of a smooth tongue and highly coloured pictures, had succeeded in selling, at very high prices, some very suitable varieties of fruit, and some very unsuitable, generally, such as could

be purchased by him cheapest. Dishonest tricks, as usual, had also been practised on the unwary. On more than one occasion I saw young Clinton grape vines growing, to which were attached labels with high sounding names not to be found in any fruit catalogue; pure inventions of these ingenious men. I found that the Northern Spy had been much recommended, and largely planted—an apple which requires the full length of the season, in our more favoured fruit sections, to mature, and which, it is very probable, will be a failure in these settlements. Others, such as the Baldwin and Rhode Island Greening, which could scarcely be expected to be entirely hardy so far north, have also been much planted.”

He goes on to advise the prospective fruit-grower in the following terms:—

“I would strongly advise those intending to plant fruit trees to have their dealings directly with responsible nurserymen, and Canadian nurserymen, too, of whom now there are many good reliable firms, to whose interest it would be to recommend, and send out only such varieties of fruit as would be likely to succeed. Trees grown in Toronto, Hamilton, St. Catharines, Fonthill, London, Paris, or Windsor, are much more likely to succeed and prove hardy than those grown in the United States, farther south. In many instances about the Sault Ste. Marie I saw abundant evidences of the partial winter-killing of the wood of fruit trees, and sometimes of the death of the entire tree from this cause, while in other cases, in the same neighbourhood, the growth was thrifty and very fair. The failures had probably resulted from one of several causes, or a combination of them, the selection of unsuitable varieties, improper treatment, and from the fact in many instances of the trees not being properly hardened to our climate.”

This advice may be well followed by the people of all new and more or less remote districts.

The Sault Ste. Marie District.

Before returning home, Mr. Saunders extended his journey to the mainland, in the direction of the Sault. He says:—

“I found that great progress had been made in this section of country during the past few years, and that the land was being rapidly settled on. Although comparatively an old settlement, it is only within the last few years that anything worth speaking of has been done in the way of thorough cultivation of the land. The earlier settlers, largely French and half-breeds, devoted their time mainly to fishing, hunting, etc., and it is only since a more enterprising and thrifty class of settlers began to move in, that the agricultural capabilities of the district are beginning to be developed.

“The season is shorter than with us, yet crops appear to mature well; seed-ing begins about the 10th of May, and fine weather prevails until about the 15th or 20th of September, when the fall rains come on, and there is not much growth after that. Frost seldom cuts tomatoes and beans until the middle of October, and winter sets in in earnest from the 15th to the 20th of November.”

The account Mr. Saunders gives of his visits to the farms of numerous settlers, and the practical suggestions resulting from his observations, will be found in Appendix S. In regard to crops and stock, the progress noticed was very gratifying, and the prospects of this district, if communications were opened up by railway construction, would be excellent.

Of the timber on the Island of Manitoulin, Mr. Saunders says :—

“A very large quantity of cedar is growing on the island, chiefly on the south shore. The bulk of the trees are large, but many of them are dead in consequence of the fires which have prevailed in some seasons, yet the timber, in most instances, is sound and in good condition. A large number of railroad ties and considerable quantities of telegraph poles and material for cedar block pavement are annually got out here ; one firm in Gore Bay has received orders for 60,000 railroad ties this season. Cedar wood is also much used for boat-building and fencing.”

CHAPTER XVIII.

DISEASES OF STOCK. STOCK REGISTERS.

Before bringing their report to a close, the Commissioners think it proper to make a few remarks on the subjects indicated in the head of this chapter. That health and hardiness pre-eminently characterize the stock of the Canadian farmer, as a rule, is a fact perfectly indisputable. Those fatal epidemics that decimate the herds of Great Britain, and are not unknown in the United States, do not visit Canada. With few exceptions, where disease presents itself, it is traceable either to an unhealthy condition in imported stock, or to some local and temporary cause. As a protection against the spread of any infectious disorder, should such appear, and to secure the readiest information of the health of the stock in any district, the Government of Ontario has appointed qualified veterinary practitioners as inspectors, who, acting under a chief inspector—Mr. Andrew Smith, Principal of the Ontario Veterinary College—may at any time be referred to, should occasion arise. Mr. Andrew Smith, as already mentioned, gave evidence before the Commission in connection with the subject of horse-breeding; and the opportunity was taken to put some questions to him at the same time in regard to diseases of stock. Circulars addressed to qualified practitioners in various parts of the Province have elicited very similar information.

Mr. Smith's emphatic statement is:—

"The cattle of this country are entirely free from any contagious disease whatever."

The question whether *tuberculosis* is or is not contagious, was discussed, but, on this point, Mr. Smith said:—

"Some people go so far as to say that it is a contagious disease, but my experience is the reverse; I would not term it a contagious disease. My opinion on this point differs from that of some of the veterinary surgeons in the United States.

"Professor Law, for instance, holds *tuberculosis* to be contagious. My own experience, however, is, that it is not, and I have had evidence sufficient to satisfy me."

But Mr. Smith does not regard the disease as less serious in its immediate

consequences on this account, nor does he under-rate the importance of guarding against its extension. He says respecting it:—

“Thoroughbred cattle are subject to complaints from which other cattle are comparatively free; I think, in particular, they are more liable to *tuberculosis*. This disease, which ultimately proves fatal, is not allied to any form of *pleuropneumonia*. The latter is a disease which attacks the pleura and lungs, while *tuberculosis* involves many other organs besides the lungs, including the digestive organs. It appears also in the form of tubercular deposits, and is, to a great extent, due to hereditary influence.

“It is constitutionally hereditary, and is a disease which, I believe, is spreading among thoroughbred cattle, and which will continue to spread, unless very great care be taken to breed only from animals that are entirely free from it. By a careful selection of breeding animals it may to a great extent be avoided.

“Sooner or later this disease generally proves fatal. The indications are, a general falling off in condition, and, if the disease affects principally the lungs, disease of the lungs; if the bowels, irritation of the bowels, occasionally constipation, diarrhoea, and gradual wasting. It is a disease which destroys a great many of our high-priced cattle.

“If the disease has run for a long time it becomes incurable. You may arrest its progress partially, however, by judicious management. The disease is also liable to aggravation from want of care and bad ventilation.

“An animal having a constitutional tendency to *tuberculosis*, might avoid the disease if great care and good treatment were given it. I do not know, supposing the disease were avoided for a generation or two, that it might be eliminated from a family affected by it. I would not recommend the breeding from an animal affected by this disease.”

On this subject Professor Brown says:—

“I am sorry to say that I have had considerable experience with *tuberculosis*, or animal consumption, among cattle in Canada, but I do not find that the Short-horn is any more liable to it than other breeds. We have had cases of it among all breeds except the Hereford. With the exception of this disease, which has attacked our cattle considerably, we are remarkably free from cattle diseases in this country.”

The practice of in-breeding is no doubt more or less at the bottom of the tendency to this disease. That in-breeding, where skilfully conducted, does not necessarily cause weakness of constitution, has been demonstrated by the success of many of the greatest and most famous breeders of stock. But unskilful and ignorant in-breeding is full of danger, and it is probably this that has laid the foundation for tubercular disease in some families of thoroughbred cattle.

Farmers purchasing, or breeding from, thoroughbreds, cannot use too much caution in securing animals of a healthy, vigorous type, and no temporary loss to breeders, should be too great to prevent the rooting out of those which exhibit any symptoms of this insidious disorder.

The liability of milking herds of cattle to milk fever has been noticed already. To some of the complaints to which sheep are liable, and to the general healthiness of the flocks in Ontario, reference has also been made.

Abortion.

In the course of the inquiry, the tendency to abortion among cows, was treated upon, but nothing elicited that threw much fresh light upon this occasional source of trouble. Mr. Clay says on this point:—

“We have very little abortion among our cows, and in going through our stock books we find it becoming very much less. This, I believe, is due to a more sparing use than formerly of rye, which has a most injurious effect upon the breeding qualities of cows. The same applies to Indian corn. It is the ergot which forms on these two grains that makes them specially injurious in that respect. I believe the less you have to do with rye for feeding to cows the better, and the more natural food, such as hay and roots, you give them, the more certain you will be to have good results. In the month of September you will see a fungus—smut—growing on western corn especially, and in that smut there is a large amount of ergot, which has the same effect on cattle as rye. I am going to give up the growth of rye entirely. We have very little difficulty in getting our cows to breed. In our large herd we have not, at the present moment, six which are not regular breeders. We keep very accurate statistics relating to our stock. We have a breeding list printed every month so that we can tell exactly how the business is going. I attribute our success in breeding to the animals getting plenty of outdoor exercise and being fed on their natural food.”

While, in a few instances, cases of abortion were mentioned, neither that tendency nor barrenness appeared to be so frequent as to call for particular remark.

Glanders.

In regard to the diseases of horses, the evidence is quite as reassuring, generally, as that relating to cattle. Mr. Smith, however, called attention, pointedly, to one matter that may invite more active measures than have yet been taken to prevent the spread of a most dangerous and malignant malady. He says:—

“I omitted to state that horses are subject to a contagious disease called glanders, which sometimes prevails in certain districts to a considerable extent. We have a law, intended to prevent the spreading of glanders, but it has never been enforced as it should be. In the majority of cases, glanders can be traced to contagion from horses already in the country. I do not think that a glandered horse has ever been imported into Ontario.

“The disease is always prevailing somewhere, and liable to be disseminated; it never quite dies out. It is possible that it may be spontaneously generated. It is a well marked example of a contagious disease, admitting of spontaneous generation. Recently, however, one or two veterinary surgeons in England—Mr. Fleming in particular—have inclined to the belief that it is never spontaneously generated, but that it is always due to contagion in one form or another.

“I think it is possible it may be originated by ill ventilation and want of sufficient nourishment. A striking proof that it may be due, in the first place, to bad ventilation, was given during the Crimean War. It broke out among a lot of horses on board one of the transport ships. It was said that these horses were all perfectly sound when put on board, nevertheless, owing to bad ventilation, the disease broke out in a very severe form. During the American War an immense number of horses suffered from glanders, although in that case it is quite possible the disease spread by contagion.”

Symptoms of the Disease.

"The disease shows itself in a catarrhal form. It attacks the whole system but evinces itself principally in connection with the respiratory organs, accompanied by a discharge from the nose. This discharge is capable of producing the disease in another animal, being in that respect different from catarrh. It attacks the whole system, accompanied by farcy. Little ulcers are formed on the nose, and a casual observer would very easily mistake a case of glanders for one of catarrh. A horse suffering from glanders in a chronic or mild form, might live for years—two or three years while the disease in an acute form might terminate fatally within two or three weeks. The virus is in a fixed form, and must come in actual contact with an animal to cause disease. Broken-windedness will not develop into glanders, though chronic catarrh may, if aggravated by bad ventilation. Ulcers on the nose and enlargement of the glands are the characteristics of glanders, by which it may be identified.

"It is not curable in any of its forms, but is always ultimately fatal. You may as well kill your horse as soon as you know he has become diseased."

Dr. Smith goes on to remark:—

"I remember condemning a horse for being glandered, and hearing no more of him for some time; subsequently I was consulted by a farmer near Barrie, who had lost three horses by glanders, and I found that the horse which had produced the disease among the others was the same horse I had condemned a year and a-half previous.

"I think more stringent measures ought to be adopted than those at present in force. Inspectors should have the power, which they have not at present, of ordering a horse to be killed, which, on careful examination, they find to be glandered."

The evil effects of allowing stock to drink bad or polluted water, is also pointed out by Mr. Smith. He says:—

"Farmers now and again lose horses from *cerebro-spinal meningitis*, induced in most instances by bad ventilation and drinking impure water.

"Water that has collected on the surface of the ground, even when covered with a green substance, may not be so bad as it looks, and cattle may perhaps drink of it with apparent impunity. But where there is decaying vegetable and animal matter in the water, or where the drainage of a stable collects in it, disease is apt to result in stock that drink from it. My opinion is that bad water is highly injurious to animals, and that they frequently die from its use."

STOCK REGISTERS AND STUD BOOKS.

In connection with the breeding of thoroughbred animals, the subject of registration naturally came up at times for discussion. At present, registration in Ontario is in a very unsatisfactory position. There is no Ontario or Canadian Stud Book or register for horses. Thoroughbred horses may be, and no doubt in most cases are, registered in England; many having been imported, would of course be found in the English Stud Book. Some of the breeders of trotting horses have them registered in the United States, but in Canada there is no register whatever. The want of a Canadian register is felt very greatly. The necessity

for such a record was strongly urged upon the Commission by Mr. Wiser, Dr. McMonagle, and others. If it were only for the purpose of preventing valuable families of horses, like the Royal Georges or the Clear Grits, from being allowed gradually to disappear, it would be necessary and valuable. But it is needed as a guarantee in ordinary transactions between buyer and seller, and it is no less needed by every farmer who wants to know, and—if he does himself justice—is bound to know, whether the male animal he depends on for service is well bred or a mongrel. This remark applies to all sorts of stock—horses, cattle, sheep, and swine.

At the present time the only Herd Book is one for the Durham or Shorthorn breed exclusively, controlled by the Council of the Agricultural and Arts Association. Herefords, Devons, Ayrshires, and all the rest, must trust to their good looks, for they have no place in the Herd Book. If the breed is to be kept up, every breed or family of horses, and every breed of cattle, should have its register. In regard to the Clydesdale horses, it is deemed so important, that a Clydesdale Registration Society was, about three or four years ago, established in Scotland. In Boston, as noticed in a former chapter, the Holstein cattle have their Herd Book. Then, in England, there is a Suffolk Horse Society, a Hereford Herd Book Society, a Welsh Cattle Society, a Galloway Cattle Society, and recently a Shire society to perpetuate the breed of the old English cart horse. The American Herd Book, the Kentucky Herd Book, the American Trotting Register, the Ohio Shorthorn Register, and many others, attest the value placed by breeders on the existence of an authoritative record of all kinds of stock. It would not, perhaps, be expedient in Ontario, or even in Canada, to establish a number of separate books or registers; but one for all descriptions of pure-bred cattle, sheep and swine, and another for horses, would be most desirable.

The Commissioners do not propose to offer any opinion as to the principle on which the present Herd Book is conducted. Five crosses in the male and four in the female entitle to registration. The system was no doubt adopted with a sincere desire to meet existing circumstances and the wants of the country. It is a perfectly honest record, showing on its face the history of the thing registered. But it is none the less certain, that, from whatever cause, a Canadian register does not secure confidence in the States, where are to be found the best customers of the Canadian breeder. Canada is assuredly to be one great source of supply of pure-bred animals to the States. Our food supply, climate, and habits are all favourable to this form of enterprise, and enable Canadians to furnish a better article than the Americans can raise themselves. Hence another reason, not only for registration, but for registration on such a basis as shall be unimpeachable. It must not only be honest of its kind, but of the right kind in every respect.

While every farmer should understand the general principles of breeding, the business of raising pure-bred stock is really one of itself. And, while it is an open question as to who should issue a herd or stud book, it does appear to the

Commissioners only a matter of common sense that breeders, either as an advisory board or board of censors, should have a potential voice in its management. As there is absolutely no stud-book in Ontario at the present time, and as there is no stock register at all in Ontario, except the Shorthorn Herd Book, the field is an open one, and nobody should be assumed to have anything but the public interest to consult in the matter.

Intimately connected with this question is the suggestion thrown out by more than one witness for the licensing of pure-bred stud horses travelling the country, with a view to discourage the use of inferior animals. That is a proposal on which some difference of opinion will probably be found to exist, although viewed with favour by many.

The Commissioners suggest that a convention of breeders of pure-bred stock, called under the auspices of the Department of Agriculture, might be a convenient means of eliciting the views of persons most competent to advise: (1) as to what extent registration is needed; (2) the best method of securing a system of registration; (3) the principles on which in regard to the several breeds of animals, it ought to be conducted; and (4) what means could be most effectually adopted to encourage the use of only pure-bred male animals for breeding purposes.

The Commissioners believe that, if this step were taken, a scheme might be devised for ensuring, not only a sufficiently well-guaranteed record for that which has now no record at all, but additional confidence in and respect for the existing Herd Book, in whatever form or under whatever authority it might be presented to the public.

CHAPTER XIX.

STOCK LAWS.

The Revised Statutes of Ontario, chap. 174, sec. 463, provide, that the council of every township, city, town, and incorporated village, may make and pass by-laws for providing pounds, and for restraining and regulating the running at large, or trespassing of any animals, and for impounding and selling them if not claimed. Section 2 of Revised Statute 195 further provides that the owner of any animal not permitted to run at large by the by-laws of a municipality shall be liable for the damage done by such animal, although the fence enclosing the premises be not of the height required by such by-laws.

In the Province of Ontario some 330 townships have, at one time or other, passed by-laws, still in existence, giving effect wholly or in part to the terms of the above Act, or former Acts to the same purport.

From reports received from nearly every township in the Province, the conclusion must be drawn that these by-laws are, to a large extent, regarded as a dead letter, and this result appears to be attributable not so much to want of recognition of the salutary nature of their provisions, as to the absence of effective machinery for carrying them out. In some few instances, where this machinery has been locally provided, the results have been such as to justify the hope that its introduction may become general. Thus the Township of Blanshard, in the County of Perth, included in its by-law a provision for a salaried inspector who, in addition to his salary, receives a fee for each animal impounded, and who is required to visit every highway in the municipality, at least once a month. This by-law, it is stated, "has had a capital effect, in that the ratepayers look sharp after their stock, and keep them out of the officer's way." In Ancaster Township (County Wentworth), the duty of enforcing the law is also imposed on Inspectors; in East Oxford (County of Oxford), and in Toronto Gore (County of Peel), on the Road Overseers; and in Clarence and East Hawkesbury (County of Prescott), it is made obligatory also on the Road Overseers or Pathmasters, who are subject to penalties not exceeding \$5 in amount if they fail or refuse to perform their duty.

While these townships appear to be the only ones in the Province that have overcome an obvious difficulty, there are many who complain of the absence of

the requisite machinery for carrying out the law, and who evidently look to the Provincial Legislature for its amendment. The reports teem with such expressions, as "What is everybody's business is nobody's business;" "The law is treated with the utmost contempt, and will continue to be so treated while redress can only be obtained by neighbour and friend prosecuting neighbour and friend;" "I will suffer any injury before I turn public prosecutor and have my friend fined;" "The inhabitants are very forbearing, and would rather suffer loss than give offence;" "The law is inoperative because nobody has been appointed to see its provisions enforced;" "The Statutes should provide for the appointment of an officer—not a reeve or councillor—to prosecute," etc.

While there seems to be a general desire throughout the Province to have stock by-laws made effectually operative, a difference of opinion prevails regarding the *modus operandi*. In the County of Dundas, where they are reported partially operative, "people by common consent use the roadsides as pastures when the grass is good and there are no ornamental trees needing protection from cattle," from which it may be assumed that there is no general desire in that county to emulate its neighbours in the State of New York, where road fences are gradually disappearing and tree planting is becoming common under the influence of a law confining all classes of animals within the respective farms.

In some counties where there is a general desire to prevent all kinds of cattle from running on the highways, the owner of only one cow is exempted from the operation of the by-law, and this exemption is often taken advantage of by others who cannot plead poverty as an excuse for turning their stock on the roads. Thus in the Township of Hope (County Durham), it is complained that "the poor man's cow" does not receive the benefit of the road pasture, "on account of the large number of young cattle and sheep (belonging to two-thirds of the farmers) running on the said road." In the Township of McKinnon (County Huron), the by-law "is seldom or never enforced," a fact not difficult to be understood when it is found to provide that animals are not to be impounded while grazing on the roads or commons, but that their owners are liable to a fine for allowing them to run at large. Neither is it surprising that the township does not communicate the number of convictions, if any, before a Magistrate for infractions of a by-law in terms so contradictory. In the Township of Osprey (County Grey), the by-law is totally inoperative. The writer of the report says:—"I was this morning sending a cow to a thoroughbred bull for which I had paid service. On her way she was served by one of those 'roadster rats' which infest the highways." No doubt like instances are common, and are the source of considerable annoyance and loss to those who wish to acquire or maintain pure stock. In East Oxford Township (County Oxford), although the duty is imposed on overseers of highways to distrain and impound estray cattle, the by-law is reported inoperative, and there do not appear to have been any convictions. The report says: "Although three-fourths or more of the farmers never turn an animal on the road, they are put to the expense of keeping

up strong fences to protect their crops from animals that are starving on the road." Here is a case in which the majority needlessly suffers itself to be injured by the minority. The farmers can, if so disposed, by insisting on the strict carrying out of the by-law, relieve themselves altogether from the expense of keeping up road fences.

In some townships great complaint is made of the ravages of hogs on the highways. In Ellice (County of Perth), the report says: "No person cares to impound hogs, yet, I believe \$400 yearly will not repair the damage they do on the roads in our township." Though these animals, over a certain age or weight, or unringed, are generally placed under prohibition, it is certain that the laws are seldom if ever observed. To the contradictory and uncertain character of many of the provisions of those laws is probably to be ascribed the fact of their being so generally inoperative. It is difficult, for example, to determine precisely the age or weight of a sheep or hog, yet many of the by-laws prescribe the age or weight beyond which animals are not to be permitted to run at large. Where, as in a case like this, there is a difficulty in deciding whether a law has been infringed, there will always be found people ready to set aside or evade its provisions.

Some townships prohibit the grazing of all animals on the highways "except within half a mile of hotels, stores and grist mills." This exception is one almost certain to lead to difficulty. It is intended, no doubt, to benefit farmers attending those places and remaining over for some time on business, but it is certain to be taken advantage of by residents in the locality—generally numerous—and in turn by others outside the specified limit. Again, a large majority of the townships prescribe what animals may, and what animals may not run at large, and name certain months of the year and so many hours per day during which permission is accorded. Where this is done, and where it is nobody's business to prosecute, it would be strange indeed if the law were not generally disregarded.

Farmers examined by the Commissioners were very generally favourable to the enforcement of an effective stock law. Mr. Cochrane, of Kilsyth (Grey), probably expressed a very wide-spread feeling on this subject when he said:—

"I would like to call attention to a grievance that is beginning to attract attention, namely, the running at large of cattle. I would not be in favour of doing away with fences entirely; we couldn't do that, but I would be in favour of making each man take care of his own animals. It is not right that I should be compelled to fence my farm to keep out my neighbour's cattle. I don't think I should be put to the trouble and expense of keeping the animals of other people off my farm. I believe a better class of stock would be kept if cattle were prevented running at large."

On the whole, it seems difficult to arrive at any other conclusion than that a stock law, whether local or general, to be thoroughly effective, should be directly prohibitory, that there should be no exemptions whatever, and that the duty of prosecuting should be handed over to a competent salaried officer, with the understanding that he is to do his duty independent of all local influences.

To sustain this opinion it is fortunately not necessary to travel outside of our own domain. While, as has been before stated, the stock laws now existing in the Province, and based on well-designed legislative enactments, are almost wholly inoperative, nevertheless there are localities where these laws have been effectively and beneficially enforced. In addition to the Township of Blanshard, in Perth County, already adverted to, North Cayuga (County of Haldimand), has a law providing that "any person, after being notified either verbally or in writing, who shall, twenty-four hours after receiving such notice, wilfully allow or permit any animal, his or her property, or in his or her possession, to run at large contrary to the requirements of this by-law, shall forfeit or pay a fine of not less than \$1, or more than \$5, upon conviction thereof before a Justice of the Peace," etc.; but "this shall not interfere with any other remedy or proceeding." In this township it is reported the by-law is operative and convictions have been had. In the township of East Whitby (County of Ontario), a by-law, than which it is stated none ever enacted by the municipality caused so much excitement, was passed in 1879. It has been productive of the most salutary effect in at least one locality. In the village of Columbus it is strictly carried out, "and," it is added, "the change is manifest in parties starting to beautify the roadsides." In the township of Westminster (County of Middlesex), where the by-law is reported partially operative, lives a sturdy agriculturist, who determined that, so far as he was concerned, it should not become a nullity. Mr. Thomas Carruthers, of lot 7, concession 5, planted trees in front of his land, and for some years has strictly enforced on his road the law prohibiting the running of animals at large.

There can be no doubt that a good deal can be done by individual effort to make stock laws a real benefit to a community, and, where the desirability is generally acknowledged, it would seem that there ought to be no difficulty in carrying them out in accordance with the spirit of recent legislation, and without further legislative interference. In districts where there is a large area of wild land and few clearings, stock laws are unnecessary; in closely-settled and cleared up regions their utility must be evident. In the United States, particularly in the West, they have come to be regarded as an important adjunct of civilization.

In New York State they are largely operative, and so popular have they become that gentlemen of experience, from whom reports have been received, declare their belief that fifty persons will be found to approve where only one will condemn, and that it would be impossible to find a legislator from the rural districts who would dare to make an effort to strike them from the Statute Book. Under the operation of these laws the highways and byways of the State have practically become a portion of adjoining farms; the grass is turned into hay, the weeds are checked before their seeds ripen and spread over the fields, shade-trees are planted which require no protection during their early growth, and private residences, heretofore fenced in, are now open to the roadways. The only people opposed to these laws are those

who, not being landholders, desire free pasture for cattle, on what they had been accustomed to regard as common land. As in some parts of Ontario, an opinion seems to hold that the laws would be even more operative than they are were their provisions simplified and the duty of impounding cattle made incumbent on the overseers of highways, thus obviating the objection that the enforcement of the law by private individuals often engenders ill feeling among neighbours. The opinion is also advanced in some quarters, that with the stock-laws should be coupled a rigid enactment for the destruction of noxious weeds on the public roads.

In Ohio it is provided that owners letting cattle, horses, mules, sheep, goats, swine or geese go astray, shall be liable to a penalty of not less than one nor more than five dollars for each offence, and shall be further liable for damage done without reference to the fence that may enclose the premises of complainant. Further, any person finding any animal at large *may* and a constable *shall* take up and confine the same forthwith, that it may be treated as an estray. But, nevertheless, commissioners of counties may grant general permission for any of the animals named to run at large, and in counties where there are no commissioners, township trustees may grant special permits, revokable at discretion, on three days' notice. But swine must be prevented by rings or other means from rooting, if they are permitted to run at large.

In Michigan, similar powers are vested in a Board of County Supervisors, and in any county in which those powers are exercised, any person owning or occupying land, may seize and take possession of strayed animals found on the highway opposite such land, or trespassing on his premises. He is to inform a justice of the peace of such seizure, and the latter is empowered to authorize the sale by auction of the animal or animals seized. If not claimed before sale, the animal or animals shall be sold, and the following sums deducted from the proceeds:—Justice's fees: For every horse, \$1.00; for cattle, 50 cents each; sheep or swine, 25 cents each. To the person making the seizure: For every horse, \$1.00; for cattle, 50 cents each; for sheep, 10 cents each; for swine, 25 cents each; together with reasonable compensation for the care of such animal while in custody. The balance, if not claimed within a year, goes to the Township Treasurer. (The owner of any animal seized may redeem it before sale on payment of fees.) A later law, however, leaves legislation on this subject wholly in the hands of the people of each township, who may at any legal meeting make orders and by-laws determining the time and manner in which the animals named shall be restrained from going at large, and fixing the penalties incurred by the breach of such by-laws.

The Commissioners submit the information they have obtained on this subject, knowing full well the nature of the difficulties that have to be overcome in order to secure a due enforcement of such laws as already exist in this Province,

and the objections that may be raised to a general Act similar to the one existing in New York. That a very general feeling prevails in favour of a more stringent law than now exists is pretty evident, and if tree planting is to become general, it must be accompanied by some legislation in this respect. Meantime, the creation of an active public sentiment may do much to make existing by-laws far more effective.

CONCLUDING REMARKS.

The Commissioners will now bring their review of the evidence taken by them to a close with a few general observations on some points not yet fully disposed of. In the preceding chapters frequent reference has been made to the returns from townships in Appendix B, and the information thus obtained has been already so freely drawn upon as to render a separate reference to it unnecessary.

As stated at the outset, the Commissioners expressed their opinion of the character of these returns and their appreciation of the conscientious manner in which the major part of them had been prepared. They must, however, be regarded rather as inviting further investigation, founded on their contents, than as absolute and final in themselves. For instance, the reply as to the proportions of first-class or inferior farm buildings in each of the townships forming a county would have to be supplemented by a return of the precise number of such in each separate township before an exact average for the county could be struck. The same applies to the area under cultivation for particular crops, the proportion of farmers using machinery, and some other portions of the returns. This would require a complete census, officially prepared, and a considerable time for analyzing and working out the details. At the same time, the approximate averages struck from the returns, when tested by other materials for forming a judgment, have usually been found to be quite sufficiently accurate for ordinary purposes, if not for exact calculation.

Much of the matter, however, contained in these tables is complete in itself, and, by referring, as can be done most conveniently, to townships, any intelligent person desiring fuller information than the county summaries afford, can obtain it, while those summaries, on the other hand, will assist most effectively all who desire general information as to any one county or the whole Province.

How far settlement has progressed, and at what rate, is shown by the replies to the first three questions. Looking at the nature of the country in its primeval condition, at the prejudices and ignorance which existed abroad, and are not yet wholly removed, as to its climate; to the temptations to settlement offered by the busy and enterprising people of the adjoining Union; and to other difficulties connected with the political position of Canada, now happily for ever removed; the

progress in settlement achieved in Ontario up to the present time, and the completeness of the internal communications established, are causes for pride and gratification.

And when the eye glances over the returns showing the comparatively small area of poor or uncultivable soil, or when the evidence is examined relating to fruit culture, coupled with that respecting meteorological observations, no one can pretend to deny that Ontario is "a pleasant land," and that both climate and soil are certain to respond liberally to the call of the husbandman.

Not less generous is nature in providing means for the growth of those products best adapted to the raising of animals in demand, not only as food for the European consumer, but by the busy nation to the south of us for breeding, and for many economical purposes. Mellowed by the influence of the great lakes, while still bracing enough to impart health and vigour to the animal frame, in these respects the climate of Ontario leaves nothing to be desired.

The forest wealth of Ontario has been fully touched upon in Chapter IV. The returns from the Township Clerks show a total acreage of 21,081,575 acres in that portion of the Province comprised in township municipalities. That again, it may be remarked, lies all to the south of the Ottawa and Lake Nipissing; it includes incorporated townships only and must not be confounded with the acreage of the Province as a whole. Of this area 9,877,182 acres are reported as cleared, the balance, presumably uncleared, being about 11,000,000 acres. It must be observed, however, that no less than $7\frac{1}{2}$ millions of acres of the uncleared land are to be found in sixteen county municipalities, leaving the remaining twenty-one only about $3\frac{1}{2}$ millions of acres between them. Nor must it be too hastily assumed that the uncleared always represents timbered land. Deducting marshy and undrained portions, some very rough sections, and lands that have been denuded of their forest growth by fire, the quantity of available timbered lands will be found sufficiently reduced in the older counties to justify all that has been said on the necessity of tree planting, and the effects of forest clearing.

For reasons already suggested the averages of first class or inferior dwelling houses in rural Ontario cannot be accepted as exact, but the Commissioners believe they are sufficiently accurate for the general purpose of showing the progress made in this direction, the rate of progress corresponding in most cases pretty nearly with the length of the period of settlement, at all events in those districts where the course of improvement has not been retarded by natural disadvantages or the character of the earlier immigration. Approximately, then, about 45 per cent. of the dwellings of the farmers of Ontario appear to be, in the terms of the question, brick, stone, or first-class frame. Of out-buildings the proportion stated to be

first-class is 54 per cent., rather in excess, it will be observed, of the improved dwellings; showing that no inconsiderable number of farmers prefer to make shift with less showy or less convenient and comfortable houses for themselves, in order to provide adequate accommodation for their crops, and good shelter for their stock. This prudent disposition, it may be remarked, has been the subject of observation among the Commissioners during their travels in various parts of the Province, and in none more so than in some of the newly-settled sections. It may safely be averred that no better means of securing ultimately a good house for himself than an investment in good buildings, can be devised by the agriculturist in this country. But among the remaining 46 or 47 per cent. there is urgent need for improvement.

Very satisfactory is the almost universal use of labour-saving machinery. If the average all over be taken, it would appear that 71 per cent. of the farmers of Ontario use machinery in their ordinary operations. But, as a matter of fact, if the area still encumbered with stumps, where machinery cannot be successfully employed, be eliminated from the calculation, the use of machinery may be said to be all but universal. The exceptions to its use in well-settled counties are very few indeed. The supply, too, of ingenious inventions keeps pace with the demand. It was informally stated in the course of the inquiry that only two wants in this respect needed to be supplied, the one a machine for sowing gypsum, the other, one for distributing liquid manure to the roots of plants. It is believed that the first mentioned desideratum has been provided; the other will not be long behind. So far as the purchase of machines is concerned the danger is rather in the direction of a too ready yielding to the persuasiveness of the agent introducing some novelty which is not invariably an improvement, backed by the beguilements of offers of long credit. But the reasonable desire to lessen manual labour, and abridge the time needed in particular operations at seasons when time is very precious, is the best ally of the agricultural implement or machine maker.

It would be very gratifying to know, that out of 403 townships reporting on the use of special fertilizers, in 286 these valuable aids to the agriculturist are employed—were it possible, on the evidence, to believe, that their use is general in any considerable proportion of the number last mentioned. But in too many cases it is clear that their application is confined to the more enterprising farmers. No country could be more favoured with an abundant supply of these products, and only an intelligent knowledge of their value is needed to ensure their far more liberal and general application.

The subjects of crops and stock have been somewhat exhaustively discussed

elsewhere. It is only necessary here to allude to what may, at first sight, appear to be the comparatively small profits of the ordinary farmer on his outlay. That the profits are much less than they might be with better management is not to be questioned, nor is it denied that, even at present profits, some not very good farmers manage to make a living and more. It has, however, to be borne in mind, that on every estimate of the cost of crop raising, the whole amount of labour is charged. The farmer's own time, and that frequently of his son or sons, is thus paid for before the balance of profits is struck, and this item is, for a large portion of the year, equal probably in amount to the whole requirements of the household, so far as money purchases are concerned. The same remark applies to charges for attendance on stock, marketing produce, and other operations. If these be deducted from the outlay account, the profits will be very considerable in many cases where otherwise they would appear very small. Where, too, the farm is owned by the occupier, and unencumbered by mortgage, the charge for interest goes into the farmer's own pocket, although it has to be debited in the account before the actual cost of a crop can be correctly ascertained. If it be recollected that, in addition to those circumstances already mentioned, the farmer supplies all the needs of himself and family, so far as the first necessities of life are concerned, at wholesale price, even if he charges all his household consumption as he is supposed to charge the stuff consumed by his stock at market rates, another source of saving, which is equivalent to profit, is ascertained.

The Commissioners would have been glad to have had an opportunity of inquiring into the proportion of labour employed on Ontario farms, and the general character of the arrangements between the employers and the employed. Opportunity has not offered for such an inquiry beyond eliciting some general information. The opinion of good farmers is, that not less than three adult males, or a force equal to that strength should be employed on every 100-acre farm, and can be so employed profitably. The disposition to provide for the accommodation of married labourers also appears to be increasing.

The work of the Commissioners is now concluded. How imperfectly, looking at the importance and many bearings of the subject remitted to them, they are only too sensible. Their duty was a novel one. Their course had to be shaped from time to time, as experience was obtained or suggestions were presented. They have sought to leave nothing undone that could be reasonably expected to be done in the time, and with the means at their command. And their labours have been lightened by the hope that a clearer sense of what may be achieved by intelligent and well-directed efforts, may inspire the agriculturists of Ontario with increased determination, to attain in everything to the highest and

the best. Let it be remembered that, in the simplest operations of this most honourable of pursuits, the farmer who proceeds—not upon chance or by merely traditional habit but—on sound principles, is elevating his calling from the mere drudgery of toil to the dignity of a science, as he seeks to co-operate with Nature's beneficent laws, and to secure his full share of her bounties. If he keeps this steadily in view it will give a new charm to labour, and present at each step fresh objects to awaken his interest or to stimulate his ambition to excel.

All which is respectfully submitted,

(Signed) SAMUEL CASEY WOOD, *Chairman*.
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TORONTO, *February, 1881.*

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ONTARIO AGRICULTURAL COMMISSION.

APPENDIX Q.

EVIDENCE

RELATING TO

Meteorology in connection with Agriculture,
WITH A MAP.

ONTARIO AGRICULTURAL COMMISSION.

APPENDIX Q.

EVIDENCE

RELATING TO

Meteorology in connection with Agriculture, WITH A MAP.

Sittings to take oral evidence, held at Toronto, August 17th, 1880. *Present—*
Messrs. E. H. HILBORN (Chairman), Hon. S. C. WOOD, and A. H. DYMOND.

MR. T. H. MONK'S EVIDENCE.

T. H. MONK, Toronto, was called and examined.

To Mr. Hilborn.—I am a clerk in the meteorological service, in the employ of the Dominion Government. I have been in that position for a little over five years. During that time I have noted weather changes and other meteorological phenomena, and examined returns made by others.

STATIONS IN ONTARIO—DEFINITION OF CLIMATE.

My principal duties have been in connection with the correspondence with stations, of which we have in Ontario about fifty. The climate of a country is the condition of that country with respect to weather. The term "climate" is usually understood to mean the sum total of the changes in the atmospheric pressure, temperature, humidity of the air, amount and distribution of the rain and snow fall, the prevalence of certain winds, the condition of the sky with respect to clouds, whether clear, fair, or cloudy, etc., in any district or locality.

CHANGES OF CLIMATE AND CAUSES—LOCAL INFLUENCES.

Owing to the influence of the topographical features of a country, the climate is subject to various modifications according to the locality. For example, the climate of Ontario, generally speaking, is much influenced by the vast bodies of water by which it is partly surrounded. Out west there are considerably lower temperatures in winter, and very much higher temperatures in summer than here. The capital of the State of Iowa, for instance, has a very much lower temperature in the winter than Toronto, and higher in the summer. The contiguity of the lakes tends to make our climate partake more of an insular, than a continental character. Except in the north and north-east, the heat in summer and cold in winter are moderated by their influence.

THE CLIMATE OF THE OTTAWA REGION.

In the region of the Ottawa, the extremes of temperature are much greater than at places in the vicinity of the lakes, and naturally, within certain limits, the farther we go from the lakes, the less their influence is felt.

VARIATIONS IN RAINFALL.

The rainfall varies both in the amount and distribution according to the locality. As far as can be seen from the statistics of the weather, published by the Dominion Government, we find that, at those places bordering immediately on the lake, the total amount of moisture deposited in the shape of rain and snow is greater than at places farther inland, but in the northern part of the Province it increases again.

[*Mr. Monk.*]

INFLUENCE OF THE FORESTS.

This may be due to the fact that the forests exercise an influence in some way. I have here a map by means of which I have tried to explain this matter, but the observations are taken at so few places that the figures cannot be depended upon as representing the rainfall with strict accuracy throughout the whole district.

PROPORTION OF SNOW TO RAIN.

We consider ten inches of snow equal to one inch of rain. The marks on another map, which I produce, show where the stations are situated at which observations have been taken for more than four years.

DIVISIONS OF THE PROVINCE.

It is usual, in speaking of the rainfall and snowfall, to divide Ontario into four districts, the west and south-west, the west and north-west, the north-east and east, and the central. There is a great difference between the rainfall of Toronto and the district in which it is situated. From this we see the influence of locality.

RECORDS OF OBSERVATIONS.

The records of meteorological observations for Toronto extend over thirty-nine years, —of the rain and snow fall over thirty-six years.

TABLE OF RAINFALL.

I will show you some tables of the variation in rainfall from year to year, from which you will see that it is necessary that observations be taken for a number of years.

TABLE

SHOWING AGGREGATE OF RAIN AND MELTED SNOW IN INCHES FOR EACH MONTH AND FOR THE YEAR, FROM 1843 TO 1871, INCLUSIVE.

The months of incomplete years are not included in the general means.

Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
1843.	5.715	5.915	3.195	3.195	1.570	4.595	4.605	4.850	9.760	4.040	4.885	1.850	50.175
1844.	5.495	1.430	3.870	1.515	5.670	3.535	2.815	.....	.....	.....	.....	.....	.....
1845. ....	.....	.....	.....	3.440	2.300	3.715	2.195	1.725	6.245	1.760	1.305	0.470	.....
1846.	2.935	4.610	2.195	1.430	4.375	1.920	2.895	1.770	4.595	4.189	5.845	1.815	38.565
1847.	2.885	3.280	1.270	3.270	2.040	2.625	3.355	2.140	6.665	4.390	3.155	1.865	36.940
1848.	2.955	1.855	2.190	1.505	2.520	1.810	1.890	0.855	3.115	1.550	2.160	4.400	26.805
1849.	2.095	2.160	1.755	2.825	2.115	2.020	3.415	4.970	1.480	5.965	2.915	1.800	36.515
1850.	1.770	3.545	1.865	4.830	0.545	3.345	5.270	4.355	1.735	2.085	2.955	3.140	35.440
1851.	2.055	2.840	1.650	2.415	3.000	2.695	3.625	1.360	2.665	1.710	4.555	2.145	30.715
1852.	3.090	1.950	5.030	2.930	1.125	3.160	4.025	2.695	3.630	5.280	1.975	6.005	40.895
1853.	1.040	2.290	1.790	2.725	4.420	1.550	0.915	2.575	5.140	0.875	2.695	2.855	28.870
1854.	2.020	3.260	2.705	2.955	4.630	1.460	4.805	0.455	5.375	1.495	1.245	2.310	32.715
1855.	2.855	3.950	3.295	2.190	2.655	4.070	3.245	1.455	5.585	9.565	4.890	4.795	41.550
1856.	1.360	0.970	1.620	2.790	4.580	3.200	1.120	1.680	4.105	0.885	2.325	3.420	28.055
1857.	2.180	4.220	1.465	3.045	4.145	5.060	3.475	5.265	2.640	1.060	3.925	4.105	40.585
1858.	1.552	2.670	0.937	1.652	6.367	2.943	3.072	3.800	0.735	1.797	4.279	2.697	32.591
1859.	3.089	1.285	4.154	2.647	3.410	4.085	2.611	3.990	3.525	0.940	5.253	4.775	39.764
1860.	1.610	3.210	1.122	1.312	1.815	2.136	4.336	3.405	1.959	1.618	2.759	2.712	27.994
1861.	2.745	3.785	2.835	2.309	3.430	2.329	2.635	2.953	3.607	1.993	4.614	1.240	34.475
1862.	2.855	2.490	4.410	2.255	1.427	1.007	5.344	3.483	2.344	2.734	2.735	2.985	34.069
1863.	3.182	3.650	1.827	2.370	3.373	1.662	3.408	2.208	1.235	2.522	3.666	3.670	32.773
1864.	3.795	1.347	1.990	3.983	4.070	0.570	1.332	5.060	2.508	3.321	4.215	4.755	33.946
1865.	1.920	2.490	4.940	4.172	4.005	2.005	2.470	1.990	2.450	3.155	1.085	2.247	32.929
1866.	1.552	2.520	2.635	1.675	2.820	2.720	5.390	4.457	5.657	2.470	3.183	4.340	39.419
1867.	4.200	2.668	3.957	2.867	3.220	0.885	1.965	2.440	1.226	1.970	1.925	2.768	30.091
1868.	1.460	3.320	3.080	1.520	7.670	2.217	0.510	1.562	4.239	1.565	5.580	1.555	34.278
1869.	1.867	4.135	2.485	3.015	2.805	4.373	4.610	4.273	4.027	1.192	3.560	3.300	30.642
1870.	5.542	2.530	6.995	2.155	1.150	8.090	1.896	3.422	6.794	2.699	0.904	4.020	46.188
1871.	5.224	2.340	4.082	3.448	2.302	3.340	1.255	2.800	1.290	1.185	3.105	2.360	32.731
Means....	2.724	2.788	2.795	2.648	3.281	2.810	3.092	2.976	3.633	2.416	3.348	3.109	35.615

[Mr. Monk.]

TABLE

SHOWING DEPTH OF SNOW IN INCHES IN EACH MONTH AND IN THE YEAR, FROM 1843 TO 1871,
INCLUSIVE.

The letter S denotes that Snow fell, but that the amount was inappreciable.

Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
1843.....	14.2	14.4	25.7	0.1	..	..	..	..	..	2.5	1.2	8.1	66.2
1844.....	24.9	10.0	14.0	S.	..	..	..	..	..	12.0	8.0	4.2	73.1
1845.....	22.7	19.0	2.8	1.5	..	..	..	..	..	S.	5.0	4.7	55.7
1846.....	6.0	46.1	2.3	1.3	..	..	..	..	..	S.	0.4	6.0	62.1
1847.....	7.5	27.3	4.2	4.0	..	..	..	..	..	S.	..	6.8	49.8
1848.....	7.1	10.8	9.7	0.5	..	..	..	..	..	0.0	1.4	16.5	46.0
1849.....	9.2	19.2	2.3	1.7	..	..	..	..	..	S.	1.0	9.6	43.0
1850.....	5.2	23.1	11.2	1.1	S.	..	..	..	..	0.0	S.	29.5	70.1
1851.....	7.8	2.4	8.8	1.2	0.5	..	..	..	..	0.3	6.7	10.7	38.4
1852.....	30.9	13.0	19.5	9.4	S.	..	..	..	..	0.0	2.0	20.1	94.9
1853.....	7.5	12.6	7.1	1.0	S.	..	..	..	..	S.	2.7	22.3	53.2
1854.....	7.5	18.0	2.8	2.7	..	..	..	..	..	S.	1.3	17.2	49.5
1855.....	23.3	21.8	18.1	1.6	0.9	..	..	..	..	0.8	3.0	29.5	99.0
1856.....	13.6	9.7	16.2	0.1	S.	..	..	..	..	0.1	9.5	16.3	65.5
1857.....	21.8	11.7	11.3	12.9	S.	..	..	..	..	0.2	6.9	9.0	73.8
1858.....	4.0	26.7	0.2	0.1	..	..	..	..	..	S.	4.0	10.4	45.4
1859.....	16.4	8.3	1.0	1.2	..	S.	..	..	..	S.	0.6	37.4	64.9
1860.....	8.7	18.8	2.4	0.3	..	..	..	..	..	S.	1.9	13.5	45.6
1861.....	20.6	29.7	7.1	6.9	0.5	..	..	..	..	S.	3.2	6.8	74.8
1862.....	27.4	23.1	18.5	0.2	..	..	..	..	..	0.5	5.3	10.4	85.5
1863.....	20.6	22.0	11.4	1.6	0.1	..	..	..	..	0.0	0.1	7.1	62.9
1864.....	26.3	9.5	3.7	3.5	..	..	..	..	..	S.	4.5	27.1	74.6
1865.....	14.8	16.8	18.9	2.0	..	..	..	..	..	4.5	1.1	5.2	63.3
1866.....	10.3	16.3	7.2	S.	..	..	..	..	..	S.	2.2	15.5	52.1
1867.....	42.0	13.4	33.4	7.2	S.	..	..	..	..	0.0	0.9	13.6	110.5
1868.....	14.6	32.8	4.2	5.3	..	..	..	..	..	2.0	4.3	15.5	78.7
1869.....	9.8	39.7	15.0	0.5	S.	..	..	..	..	2.3	10.2	7.1	84.6
1870.....	21.3	20.1	62.4	0.1	..	..	..	..	..	0.0	3.1	15.9	122.9
1871.....	43.6	23.0	13.0	1.3	..	..	..	..	..	0.0	4.5	14.2	99.6
Means....	16.88	19.31	12.22	2.39	0.07	..	..	..	..	0.87	3.28	14.14	69.16

HIGHEST AND LOWEST TEMPERATURES.

The part of the Province in which the temperature is lowest in the winter is the north and north-east, in the vicinity of Ottawa and along the Ottawa River, for example. We have not had observations taken for any length of time higher up the river than Pembroke. In the region of the Ottawa also the highest temperature in summer prevails. There the climate is far more continental than in any other part of the Province; that section of the country being far away from the lakes, the climate is very much the same as in some of the Western States.

TEMPERATURE AT FITZROY HARBOUR, PEMBROKE, SIMCOE AND HAMILTON.

In 1878 the temperature at Fitzroy Harbour was 30.07° below zero, and at Pembroke 25° below; while the highest temperature in the summer was 99.08° at Fitzroy Harbour and 97.03° at Pembroke. In the south and south-west the lowest temperature was at Simcoe, 14 degrees below zero, and the highest temperature at Hamilton, being about the same as at Ottawa.

EFFECT OF LARGE BODIES OF WATER.

Large bodies of water do not get heated up so rapidly as the land, and they cool the air while it is passing over them; but as soon as the air gets a little distance inland, it becomes heated up by the land it is passing over.

[Mr. Monk.]

TEMPERATURE IN THE WESTERN STATES.

We have an example of this in the Western States, where we get temperatures of 107° and 108° in the shade, in the summer.

RAINFALL IN JULY, SPRING, AND FALL.

Taking the Province as a whole a greater amount of rain falls in July than in any other month in the year; but the wettest months in the year occur in the spring and fall when the showers are more frequent. The larger amount falling in July is probably due to thunder storms in which the rain falls heavily for a short time.

RAINFALL IN SEPTEMBER AND NOVEMBER IN TORONTO.

In Toronto the month in which the aggregate of rain and melted snow is greatest is September, in that month it amounts to as much as 3.72 inches. The month in which it is next highest here is November, when it amounts to 3.3, and the next highest month is May with 3.2 inches. There is a great variation here in the amount of rainfall. I believe that on one occasion in June it was over 8 inches, and on another occasion in the same month it only amounted to a little over half an inch.

DISTRIBUTION OF RAINFALL.

With regard to the distribution of rain throughout the Province I may remark that there is apparently a district in the neighbourhood of the comparatively high table land on which Stratford, Granton, and Mount Forest are situated, where the total deposit of rain and snow is somewhat greater than at neighbouring places.

METEOROLOGICAL REPORT FOR 1878.

If we turn to the report of the Superintendent of the meteorological service for 1878, the last published, we find that apart from the data respecting the rainfall for the various stations in the Province, there is given on page 208 a table from which we can obtain the average rainfall for certain districts for eight or more years.

AVERAGE FALL OF RAIN AND SNOW.

I have added to this the data regarding the fall of snow, obtained from this as well as the earlier reports, and I find the average total fall of rain and snow to be as follows:—

In the west and south-west, and west and north-west districts	33.1 inches per annum.		
In the central district	27.5	“	“
In the north and north-east	29.5	“	“
And throughout the whole of Ontario	30.9	“	“

NUMBER OF RAINY DAYS.

From the same sources of information I find the average number of days on which rain fell to have been as follows:—

In the west and south-west	93
In the north and north-west	92
In the central	86
In the north and north-east	91
And in the whole of Ontario	91

[*Mr. Monk.*]

NUMBER OF SNOW DAYS.

And the days on which snow fell to have been

In the west and south-west	49
In the north and north-west	65
In the central	50
And in the north and north-east	57
While throughout the whole of Ontario the number was	54

RAIN AND SNOW FALL IN TORONTO.

From the published records of the Magnetic Observatory I find the average rainfall, not including snow, in Toronto for the past 39 years to have been 28·7 inches, being eight inches more than the average for the Province for eight or more years. The rain and snow fall together amounted to 35·8 inches, being nearly five inches more than for the whole Province. The average number of days on which rain fell was 110, or 19 above the average for the Province, and the average number of days on which snow fell was 63, or above.

COMPARISON WITH ENGLAND.

The rainfall in Ontario compares very favourably with that in England both in amount and distribution. In England the effect of locality on the rainfall is well seen; for we find that in the west it is very much greater than in the east.

RAINFALL IN WEST ENGLAND.

Buchan, who is an authority on that matter, says that the average rainfall in the west is from 80 to 150 inches, and in some years it is higher. Thus, at Seathwaite, in Cumberland, it was 183½ inches in 1861, and at the Styne 224½ inches in 1866. Away from the hills, however, still in the west, it is from 30 to 45 inches,

RAINFALL IN EAST ENGLAND.

In the east of the island and in the principal agricultural districts it is from 20 to 28 inches, very much lower than Ontario. It should, however, be borne in mind that while in Great Britain it is considered a very heavy rain if an inch falls in one day, it is not so here.

MORE FREQUENT RAINS IN ENGLAND.

Rain falls more frequently in England than it does in this country.

HEAVY RAINS IN CANADA.

Here we have had as much as three inches and a half in a day. In August, 1878, 3·45 inches fell in a very short time, and in September of the same year there was another heavy rain causing great floods throughout the country.

EFFECTS OF WEATHER ON AGRICULTURE.

It is probable that we shall find the weather affecting agriculture principally by means of the changes in temperature, moisture in the air, and the amount deposited in the shape of rain, snow, or dew, the direction and force of the wind, the state of the sky, whether clear, fair, or cloudy, and the amount of sunshine depending upon it.

[*Mr. Monk.*]

TEMPERATURE OF CROPS.

It is well known that, other things being equal, unless the temperature remains above a certain point for a certain period, crops will not come to perfection. Both this point and the duration of the period vary with different crops.

VARIATION WITH DIFFERENT CROPS.

It is comparatively seldom that wheat will come to perfection in the district near Hudson's Bay above James' Bay, whereas oats seldom if ever fail. It is the same way on the west coast of Scotland. But the degree of perfection at which crops arrive is influenced very largely by the changes in the temperature during the whole period from the time of germination onwards.

EFFECTS ON SPRING WHEAT AND FALL WHEAT.

We have had illustrations of this during the present season the disastrous effects on spring wheat being due almost entirely to the rapid changes from warm to cold weather during the spring and summer. Again, the killing of the fall wheat at the commencement of the spring was due to the same cause. If the weather had remained steadily cold or warm the effect would have been different. It should, however, be noticed that in many places the fall wheat was not destroyed, which shows the necessity of obtaining information as to the influence of locality.

TEMPERATURE OF THE SOIL.

It must not be forgotten that the soil plays an important part here. We have had no observations taken in Ontario with reference to that matter; but they have been taken elsewhere. In 1867 the Marquis of Tweeddale placed a sum of money at the disposal of the Scottish Meteorological Society, of which he was president, for the purpose of observations which might tend to the elucidation of the temperature of the soil.

OBSERVATIONS.

The result of observations taken at various places was as follows:—At a depth of three inches in *drained* soils the temperature exceeded that of the air, during the month of July, to the extent of 2·4 degrees on the mean of four stations, whereas on *under-drained* or *badly-drained* soils the temperature was less than that of the air by 0·7 of a degree. In heavy soils it was 2·1 degrees; but when the soil was heavy and under-drained it was ·5 of a degree below. These results were obtained when the thermometers were sunk under the ground under a crop of old grass; but in ground where nothing grew, which remained just as it had been dug, the temperature of the soil was still more in excess than that of the air. It is inferred from observations of the wind in connection with these observations of the soil, that the higher temperatures of the soil serve somewhat to counteract the chilling effect of the cold winds in lowering the temperature of the soil.

TEMPERATURE OF SOIL IN SUMMER.

Observations taken in the month of January show that the reverse conditions prevail then, so that it has been proved that in summer the soil is considerably warmer than the air resting on it, and in the winter considerably colder. Again, the amount of heat radiated from different kinds of soil has its effect, for certain soils cool down much more rapidly than others.

GLASHIER'S EXPERIMENTS.

Experiments by Mr. Glashier show that if the relative cooling power of long grass [*Mr. Monk.*]

be represented by 1,000, that of snow will be 657, garden mould 472, sand 454, stone 380, and gravel 288.

DATA REQUIRED.

With regard to temperature, then, we must obtain the following data if we wish to know its influence on crops, assuming, of course, that we have crop records at the same time:—

1. Highest temperature in each month
2. Lowest temperature in each month.
3. Monthly range.
4. Greatest daily range.
5. Mean of all the highest.
6. Mean of all the lowest.
7. Mean daily range.
8. Mean temperature.
9. Number of times when the maximum temperature exceeded certain points.
10. Number of times when the minimum temperature was below certain points.
11. Number of times when the mean temperature was above or below certain points.

As well as a general statement regarding the steadiness or the reverse of the temperature at any period throughout the month.

MORE NUMEROUS OBSERVATIONS NEEDED.

Records must be obtained from as many places as possible ; in fact, means should be provided for taking observations in every township throughout the Province.

INSTRUMENTS REQUIRED.

To obtain an accurate knowledge of the amount of vapour present in the atmosphere is rather a difficult proceeding ; and it is not probable that even if reliable instruments were supplied, the time and care would be generally given to taking the necessary observations. The instruments which are generally used throughout the world for this purpose are what are called the wet and dry bulb thermometers. The bulb of one of these is left in the ordinary condition, and that of the other is kept saturated by water drawn to the bulb by capillary attraction, the difference between the readings of the two instruments giving the data for calculating what is known as the "pressure of vapour."

GREAT CARE NECESSARY—RESULTS THAT MAY BE NOTED.

Great care is required in the taking of these observations and in working out the results. We can, however, approximately attain our object in various ways, such as by noting the presence or absence of dew on clear, calm nights, by recording fogs, mists, etc. The hygrometric observations are only taken at the principal stations, and very little use has been made of them so far.

DIRECTION OF THE WIND.

The amount of moisture present in the air also depends to some extent on the direction of the wind, the west and north-west winds being notably dry, while the east and south-east are vapour-bearing winds. It is impossible to tell the exact influence of rain on vegetation ; but we know that if it is less in amount than usual, vegetation does not thrive ; if more, it is liable to cause serious damage to the crops. It is, therefore, necessary to know how the crops have grown during certain periods, and what the rainfall has been during the same periods.

[*Mr. Monk.*]

DETAILS OF OBSERVATIONS AS TO RAINFALL.

The observations required with respect to rainfall are, the depth of rain, the time of the beginning and ending of it, and the direction of the wind during the rain. The object of taking observations of the direction of the wind would be, that by having records from each locality one could judge as to what wind would be most likely to be accompanied by rain, while the wind may be blowing from the west, over a large section of country, something in the locality may divert it into a south-west wind, and if it could be shown that this was a general thing it would be of great importance to the farmers to know it.

WEATHER PROBABILITIES.

If the stations at which observations were taken were as numerous as it is desirable they should be, we would then be able to give a very much better idea to the farmer of the probabilities of the weather. The object of the Dominion service is to let people know, as far as possible, the probabilities of the weather for the next twenty-four hours. These predictions are published at ten o'clock in the morning, and consequently may not be seen by the farmer in time to be of any use to him.

EFFECT OF DESTRUCTION OF FORESTS.

Great stress has been laid on the destruction of forests as influencing the fall of rain. I do not think there is much doubt upon the subject. We are all aware of instances of damage being done by the wholesale destruction of forests. But there has been a dispute as to this very question. It is maintained that the amount of rainfall is not affected by the destruction of the forests; but I venture to say that, at any rate, its distribution is; and this is one of the questions that we should be able to settle definitely by means of the observations proposed. I doubt whether any country is more satisfactorily situated for this purpose than Ontario.

IMPORTANT TO AGRICULTURISTS.

It is the number of times when rain falls that appears to be the point on which the whole question turns; but it is not this alone, it is the duration of the fall, and the amount. Therefore we should proceed to ascertain, in addition to what I have pointed out before, the number of days when the rainfall has exceeded, say, for example, one quarter inch, one half inch, three quarters of an inch, one inch, etc., and the average time it has taken in falling at the various depths.

RAINFALL IN RELATION TO WOODED AND UNWOODED DISTRICTS.

This is a point which, I believe, has never attracted attention before, and I consider it the most important of all, from an agricultural point of view; for there appears to be little doubt that the rain falls more heavily in open districts than near forests, and it is probable that the duration of the fall is less than near wooded districts. It falls also less frequently in unwooded districts. Heavy showers of rain of short duration do much less good than light continued rains, for the former have not sufficient time to soak into the ground, and therefore drain away rapidly. The heavy rains, besides damaging crops, often give rise to disastrous freshets. There is, therefore, a field here for investigation, which should prove very productive of valuable results.

FARMERS' BULLETINS.

I have shown that it is important that we should obtain a knowledge of the direction of the wind during rainfall, and that it is also to be desired that the prevailing winds
[*Mr. Monk.*]

for each day be noted, in order that we may thus have data from which to obtain a knowledge of the kind of weather accompanying winds from different directions in various localities. This knowledge has been turned to account in the United States, where they state on the farmers' bulletins, issued every month, the kind of weather which may be looked for in different localities, when the wind is from a certain direction. Such a knowledge as this amounts to giving the farmer the data from which he can ascertain the probable weather for himself. How valuable this information would prove during the harvesting season, the farmer alone can tell.

DAILY RECORD NECESSARY—SUNSHINE AS AFFECTING CROPS.

To complete the returns it is only necessary that the kind of weather prevailing during the day, or certain portions of the day, should be recorded, so that we may obtain some idea regarding the duration of sunshine. It may be mentioned here, as illustrating the necessity for information on this point, that wheat is found to require more sunshine for its proper development than any other grain, barley next, and oats least of all. In order to make an intelligent practical use of this information, reports of the condition of the crops should be obtained from as many places as possible.

RECORDS OF FARM OPERATIONS REQUIRED.

I have not prepared a definite form showing how the data required are to be obtained; but it is sufficient for the present to state that the date of sowing, the condition at stated intervals, and the ultimate degree of the perfection of the various crops, should be noted according to some uniform plan, in order that the returns may be made strictly comparable.

A MONTHLY WEATHER AND CROP REPORT WANTED.

The aspect of the fields, the soil, drainage, etc., would also have to be taken into account. The presence of blight, rust, or any other disease might be reported on the same form or separately. The result of a comparison of the record of crops and the weather should be made available in the shape of a monthly weather and crop report to farmers throughout the Province.

KNOWLEDGE AS TO LOCALITIES USEFUL.

A practical benefit to the farmer from such investigations, would be that a knowledge of the influence of locality would be obtained, from which we should be in a position to judge of the capabilities of certain localities. This information is only usually to be obtained by an extended experience occupying a considerable period of time. In many places every new-comer has to find out the peculiar advantages or disadvantages for himself.

MISCONCEPTIONS TO BE REMOVED.

Then these reports would prove perhaps as good immigration pamphlets as could be found; for an accurate knowledge of the kind of weather which prevails, as well as the class of crops which thrive best in any locality, could easily be gained from them. As our climate is so often subject to abuse, and as we have at present, in a shape to be appreciated by the general public, very little information at hand to prove that this abuse is not merited, this is by no means an unimportant feature. The climate of different localities should be compared with that of those places which have similar weather conditions in Europe, etc. People in England imagine our climate is much colder than it is, and that the fall of rain is less than in the agricultural districts of England.

[*Mr. Monk.*]

PERIODICAL CONDITION OF THE CROPS.

To the farmers generally, the monthly weather and crop report would prove an accurate guide as to the state of the various kinds of crops from month to month, and afford them a knowledge of the extensive failure or otherwise of any crop, and thus place them in a better position to know what steps to take for the future.

EFFECTS OF THE CLIMATE ON PLANTS AND ANIMALS.

Not the least important advantage would be that an opportunity would be given to deduce from the data to be obtained, by comparison as before stated, with the information respecting the climate of other countries, a knowledge of the plants and animals which would thrive here, a knowledge which can only be gained at present by repeated experiment. If these experiments do not succeed, the climate may be blamed without reason. There are breeds of cattle, sheep, etc., which it would be most desirable to stock the country with. As an illustration I might refer to Saxony sheep.

SAXONY SHEEP—PLANTS.

When I was here some time ago, I saw some samples of Saxony wool. Now, it strikes me as probable that the sheep bearing that wool could be profitably kept in Ontario, because as far as I can learn at present, I see no reason to believe that there is any great difference between the climate of Saxony and that of some parts of this Province. There are many plants, the growth of which, if it could be shown that the climate was favourable, might prove a vast benefit to the country.

BLIGHT—RUST.

Apart from these considerations, there are many scientific questions which require investigation, such as the manner in which the weather affects blight, rust, etc., and the soil of the localities in which these diseases or conditions prevail most extensively, as the growth and spread of diseases which may affect crops of any kind. It is only by obtaining such information that we place ourselves in a position to study and overcome, if possible, their effects.

PROBABLE CAUSES OF RUST.

As rust seems to occur on all kinds of soil, many adopt the view that its dissemination is to be ascribed to meteorological conditions, and that it is brought on by damp and hot weather, or by great and sudden changes of temperature. It seems to be pretty well understood, now that it is disseminated, I will not say caused, by the wheat being in rather a weak state perhaps, a heavy rain falling, and very hot weather coming afterward, causing the sap to rise suddenly in the wheat. The cells being weak, they burst, and that leaves a kind of *nidus* for this fungus, the rust. If this be so, it shows the necessity for drainage.

TOWNSHIP REPORTS.

The information which I propose should be gathered would be of no service whatever for the purpose of weather predictions from day to day. For that purpose you would require to have telegraphic communications from a large district of country. In order to obtain the information for studying the influence of the weather on crops, there should be reports from as many places in the Province as possible—perhaps from every township, or at least from stations not more than ten miles apart.

[*Mr. Monk.*]

SYSTEM IN DENMARK—SIMPLE PROCESS.

In Denmark, they have the rain stations at every ten or eleven miles, and I do not see any reason why we should not have them in Ontario within every ten miles, as the observations would take very little time, and need not be taken till the last thing before retiring at night. Then if the farmer who took the observations, would note on the same form which he used for them, anything noticeable in connection with his crop, we should be able to learn a great deal that would be of use to the agricultural community.

AGRICULTURAL METEOROLOGY—GUELPH COLLEGE.

In connection with the subject of agricultural meteorology, I have some suggestions to make with respect to its study by the students at the college in Guelph. At present, observations are taken there with a barometer and thermometer twice daily, at seven a.m., and two p.m. These are of very little service, as they do not give the mean temperature of the day. So far as I am aware there are no observations taken with reference to the temperature of the soil. I think you will agree with me that it is necessary that a student of agriculture should have as thorough a knowledge of the manner in which the weather affects the soil, crops, etc., as it is possible to obtain.

INSTRUCTION TO BE GIVEN.

In pursuance of this idea it will be seen that the study of climatology at the college must necessarily be placed upon a better footing. Not only should the student be thoroughly acquainted with the method of taking the ordinary observations, and acquire, through practice, the art of taking them correctly, but he should be made practically acquainted with the temperature of different soils, both drained and undrained. It would be well, therefore, that in addition to having the ordinary weather observations taken regularly, thermometers be obtained for taking the temperature of the soil at various depths down to three or six inches, and that the records of these thermometers be carefully studied by the students. The study of storms, their progress, etc., and the way in which they influence the general weather conditions of the Province, should have a prominent place in the *curriculum* of the college. I also think it would be well that the students should gain a practical experience regarding the method of making returns, and a knowledge of the defects which sometimes occur in them. They would thus be placed in a better position to advance the science of climatology, by becoming intelligent observers when they leave the college. It would not be necessary that the Observations taken at the college should be such as are taken at a high class station like the Toronto observatory; the observations which should be taken would be such as the highest and lowest temperature of the day, the depth of the rainfall, the number of days of rainfall, the temperature of the soil, etc.

APPARATUS ALREADY ON HAND.

To Mr. Dymond.—I believe the Dominion Government, at the request of the late President of the Agricultural College, sent some instruments to the institution on condition that observations should be taken, and that afterwards it was the wish of the President to purchase the instruments from the Government, and they were purchased. I understand the instruments were sold to the college at cost price, on the condition that returns should be forwarded to the head office here in Toronto; but they never were forwarded. I think, however, that if the importance of the study of meteorology were fully recognized, the observations would be taken fully and accurately.

HOURS FOR TAKING OBSERVATIONS.

The observations are usually taken, at stations of a similar class to the Agricultural College, at seven o'clock in the morning, two in the afternoon, and nine at night. With
[*Mr. Monk.*]

regard to temperature, if you take an observation at seven o'clock, one at two, and one at nine o'clock, double the last observation, add the whole together, and then divide by four, you obtain the mean. You can obtain the mean from the self-registering thermometer. I think that an arithmetical mean, taken from the maximum and minimum thermometers at the Agricultural College, would be sufficiently accurate for agricultural purposes.

PLAN OF DOMINION GOVERNMENT.

The plan adopted by the Dominion Government for obtaining observations includes the lending of instruments to those who will forward observations, and who are likely to do so permanently. The returns are made weekly and monthly. It would be just as important to teach the student of agriculture what relation the atmosphere bears to agriculture, as to teach him the influence of different soils. Considering that the science of meteorology is made so prominent a study in England, on the Continent, and in the United States, I think it has not received the attention that it should have at the Agricultural College.

OBSERVATIONS AT LANSING.

To the Chairman.—I believe that at Lansing, Michigan, they pay special attention to taking the observations of the weather. I am not certain whether they take observations of the soil; I think not. If the student of agriculture were taught meteorology, as he might be, he would know more about the effect of different winds, and the weather that accompanied winds from different quarters.

AMOUNT OF SUNSHINE.

To Mr. Dymond.—It would be important to know the amount of sunshine to which different fields were exposed. On the west coast of Scotland wheat will not ripen, because the sky is nearly always obscured by clouds: but on the east side, where the clouds disperse, it can be raised, although the temperature is lower perhaps on the east side than on the west. The object of taking observations is not that the man who takes them may keep the knowledge he thus gains to himself, and experiment with it for his own benefit alone, but that that knowledge may be disseminated amongst the farming community.

A SERIES OF OBSERVATIONS NECESSARY.

It would be of great service if, by taking observations, you could assist a man in coming to a conclusion as to what crops he could grow best in certain localities. In order to give him this knowledge, however, it would be necessary that observations should be taken for some time. If, then, it were found by a series of observations for a certain time, that it would be better to sow a certain crop earlier than it had previously been sown, that would be a very valuable piece of knowledge gained.

GRAIN GROWING IN SIBERIA.

Grain is grown in Siberia, which is one of the coldest countries in the world. The ground there is ordinarily frozen; but it thaws out in the summer to a sufficient depth to allow the people to get in their crops, and these come to maturity before it becomes frozen again. It is not the temperature alone, therefore, on which the ripening of grain depends. Wheat requires the most sunshine of any cereal; I think barley next, and oats the least of all for their development. The Dominion Government has so far paid no attention to agricultural meteorology. The instruments necessary for taking the temperature of the soil have been so greatly improved that I could not tell you the best at the present day. There are no stations in Ontario where the temperature of the soil is taken—none in Canada that I am aware of. The temperature should be taken at depths of half an inch, an inch, etc. You would require four or five thermometers for each place at which observations were taken, one for each kind of soil. I think good instruments cost about three or four dollars each.

[*Mr. Monk.*]

UNIFORMITY OF INSTRUMENTS.

It is necessary that meteorological observations of any sort should be taken with instruments which are exactly alike. The thermometers in use in the Canadian service are compared at Kew, and the records of these instruments are strictly comparable. The instruments for the observation of rainfall should also be exactly alike. It is necessary to have the same kind of instruments and the same method of recording observations. The mouths of the instruments for taking the rainfall should all be of the same diameter or area.

PRESENT METHOD OF RECORDING OBSERVATIONS.

The method of recording the rainfall at present employed throughout the Dominion is as follows:—A rain-gauge, having a mouth whose area measures *exactly ten square inches*, is supplied. The depth of the rain is found by dividing the cubic inches of water by ten. A glass measure is supplied for measuring cubic inches. When snow falls the depth is measured in several places, and the mean of the whole taken. Ten inches of snow are calculated to represent one inch of rain. The reason for having the mouth of the rain-gauge exactly the size mentioned is that unless this is the case, the glass measures would require to be graduated differently, or else special tables must be compiled for giving the depth of rain, corresponding to the cubic contents received by the gauge. The circular form of the gauge is considered the best, as the amount of water received in one of this shape is not influenced by the direction of the currents of air. You can, of course, obtain an approximate idea of the fall of rain by exposing any vessel with perpendicular sides and flat bottom, and measuring the amount of water received, by a foot rule; but for scientific purposes a rain gauge constructed on the plan adopted by the Canadian service is the best. The funnel shaped mouth of the gauge prevents any loss by evaporation.

REASONS FOR ADVOCATING THE STUDY.

In advocating the study of meteorology at the Agricultural College I have in view the education of a number of men in the science who, after a time, would make observations all over the Province in the sections in which they were resident. I think there are now about 50 places at which observations are taken in Ontario; but some of these are a long distance apart.

THE EDUCATIONAL DEPARTMENT.

The system was first started about ten years ago. Some time prior to that Professor Kingston made arrangements with the Educational Department of the Province of Ontario to have a number of observations taken at various high schools.

CHIEF STATIONS.

There is a chief station at Toronto, and one at Woodstock at which observations are taken at stated times and paid for, besides four or five other stations at which observations are taken and telegraphed for the purpose of predicting the weather probabilities. There are, in the total number of stations, about 20 or 25 that are voluntary. I think there should be at least one station in every township; if we could have more than that so much the better, because they would be a check upon one another.

STATIONS IN ENGLAND.—COST IN ONTARIO.

In England they have 1,700 stations. It seems to me that the whole of the observations throughout the Province, and everything connected with them, including what might be done in Guelph in the way of instructing students, might be accomplished in the way I recommend, at a cost of about \$5,000 per annum, providing instruments were supplied. At present the maximum and minimum thermometers cost about seven dollars apiece; but I think for agricultural purposes they might be got from good instrument makers and be verified in England at a cost of three or four dollars each, if a large number were taken at a time.

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A screen would be required for the thermometers but I do not think that anything else would be needed at the common stations, though it would be necessary to have an instrument showing the direction of the wind in every township. Such instruments would cost about a dollar each. Each station might be furnished with instruments at a cost of about \$20 or \$25. I think it is most desirable that the observations should be voluntary, because it has been found that it is very much better unless they are well paid for. Such observations would only occupy about five minutes a day.

SIMPLICITY OF THE WORK TO BE DONE.

The observations are so simple that they could almost be taken by a child. I do not suppose that we should be able at once to find persons willing to take them in every township; but I think that we should gradually be able to obtain voluntary observers in every township. About half the observations at present taken are voluntarily made. Some of the stations forward the reports weekly, some monthly, and some forward them by telegraph every day. The observations at the stations that I propose should be forwarded at the end of every month. The amount of rainfall, the temperature, the direction of the wind, and the kind of weather are all that I think should be noted for agricultural purposes, except that at certain stations where there were capable persons, I think that the temperature of the soil at certain seasons should be reported. The \$5,000 a year which I propose should be voted would be for classifying the observations, making out a weather and crop report, and issuing that to farmers. The crop report need not necessarily be made by the same person who takes the other observations.

THUNDER STORMS NOTED.

At the Toronto Observatory and all the other observing stations, thunder storms are regularly entered, but they have not been classified as such yet. Whenever rain is accompanied by a thunder storm there is a special mark to show it. Sometimes the observers note whether the storm has been a heavy one or not.

RAINFALL ON HIGH LANDS OR LOW LANDS.

On high lands a greater amount of rain necessarily falls than on low lands. The rainfall in some parts of England does not amount to more than 20 inches per annum, and that appears to be quite sufficient to bring the crops to perfection, distributed as the rainfall is in that country. In no place in Ontario have we as low a rainfall as that. The amount of rainfall is not so important as its distribution and its retention for a sufficient length of time in the soil. The soils from which it evaporates most quickly, such as sandy soil, require more frequent rains—not greater amounts—than loam or garden mould.

THE CEREALS AND TEMPERATURE.

The growth of such cereals as are produced in Ontario does not depend so much on having the best mean temperature as on having the temperature remain above a certain point for a certain period, and the shorter that period the higher the temperature would require to be. It is found that if the temperature remains about 65° for a reasonable period wheat crops and the like will ripen very well.

THE GULF STREAM.

The fact of the temperature being higher in the western portion of Europe than it is in Ontario, in the same latitudes, is entirely owing to the influence of the gulf stream. When you go eastward you lose the effect of that influence, and the climate becomes more continental in its rigour, so that in Russia, in the same latitudes, you will find about the same temperature prevailing as on this Continent.

EFFECT OF ATMOSPHERIC ELECTRICITY.

The effect of a greater or less amount of atmospheric electricity upon a growing crop is a
[*Mr. Monk.*]

question which is being studied in France ; but I am not aware what the results have been so far. We have no observations on electricity whatever. That is a most important point that we have not been able to pay much attention to hitherto. The expense of taking such observations, providing of the necessary instruments, etc., would not be as great an obstacle in the way, as the necessity of having the observations made by experts with great carefulness. I think that such observations might be left to gentlemen of great scientific attainments.

AGRICULTURAL CLIMATOLOGY IN FRANCE.

With respect to progress in agricultural climatology, France is probably in advance of other countries. In 1877 she had 1200 stations established to enable her people to study the influence of the weather on agriculture, and they were rapidly progressing towards obtaining records from each of the 3,600 communes.

THE SYSTEM IN GERMANY AND OTHER COUNTRIES.

Besides the general meteorological system in Germany, special investigations are carried on in Bavaria, Prussia, and other parts. Austria also has a full complement of stations. Switzerland has devoted her attention to the matter. Denmark, as I have before stated, has a rain station to about every ten miles, and in England there are no less than 1,700. Sweden and Norway have been obtaining reports for some years. On this continent, besides the well known signal service, there are very few States in the Union that have not their own services for the special study of agricultural climatology. Among these may be mentioned Michigan, Minnesota, Wisconsin, Iowa, Missouri, etc.

THOMAS H. MONK.

REPORT TO THE COMMISSION, BY MR. T. H. MONK.

TORONTO, *November 1st, 1880.*

HON. S. C. WOOD, *Chairman, etc.*

SIR,—In accordance with the instructions of the Ontario Agricultural Commission, I have investigated the question as to the amount and distribution of the fall of rain and snow, in the Province of Ontario, and beg respectfully to submit the results herewith.

THE DATA USED.

The data used in compiling the accompanying table and map, were derived from the published reports of the Meteorological Service of the Dominion of Canada, which are, so far as I am aware, the only publications at present existing, which contain results in any measure sufficiently accurate to be used in comparing the average amounts for the different localities. It should be mentioned, that data for other places, not mentioned in my table, are given in these reports, but I have only used the results of observations, which have been continued for a period of four years or more. It will be noticed, that ten of the places named—Barrie, Belleville, Cornwall, Goderich, Hamilton, Pembroke, Peterborough, Simcoe, Stratford and Windsor—are those at which, through the co-operation of the Department of Education for Ontario, with the Meteorological Service, observations have been carried on at the high schools.

WHAT THE TABLE SHOWS.

The table shows the average monthly and annual "total precipitation,"—rain and snow fall (ten inches of snow being considered equal to one inch of rain), and the average annual number of days of rain and snow, at 30, or more strictly speaking, at 29 places in the Province, the highest and lowest number in each column being distinguished by figures of a different type.

[*Mr. Monk.*]

T A B L E

SHOWING the average Monthly and Annual Total Precipitation, as well as the average annual number of days of Rain and Snow, at various places in the Province of Ontario, compiled from the data published in the Annual Reports of the Meteorological Service of the Dominion of Canada.

Name of Place.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.	No. of Days of Rain.	No. of Days of Snow.	No. of Years Observation.
Barrie.....	2.94	1.63	2.99	1.59	1.86	2.62	2.38	2.17	2.94	2.86	2.38	2.72	inches 28.98	90	72	10
Beilleville.....	3.93	2.96	4.10	2.50	1.91	2.57	2.57	1.70	2.98	3.14	3.32	3.15	31.83	92	48	8
Brampton.....	2.76	1.81	3.12	1.84	2.35	1.69	2.89	1.79	3.37	3.14	3.32	3.15	28.27	83	57	8
Brockville.....	3.87	2.66	3.82	1.92	2.28	2.03	3.44	2.52	2.73	3.42	2.77	3.43	34.89	102	58	8
Corwall.....	2.52	1.98	3.12	2.07	2.29	2.04	3.19	2.13	3.01	2.83	2.75	2.21	30.15	90	61	10
Fitzroy Harbour.....	2.46	1.62	2.40	1.46	1.63	1.64	2.43	2.45	2.78	3.34	1.98	2.37	26.76	92	57	7
Georgina.....	2.70	1.51	3.34	1.84	1.87	2.50	2.69	1.67	2.30	2.66	2.16	2.49	28.07	106	73	10
Goderich.....	3.07	1.77	2.86	1.77	2.78	2.44	2.57	2.16	3.44	3.57	2.76	3.09	31.96	111	70	10
Goderich Lighthouse.....	4.36	2.20	4.28	2.42	3.50	2.39	2.95	2.30	3.85	4.35	3.66	4.06	40.32	108	64	4
Granton.....	3.55	2.06	4.34	2.44	3.00	2.77	2.91	2.90	2.64	3.77	2.99	3.22	36.39	98	68	6
Gravenhurst.....	3.34	2.02	3.25	2.12	3.10	2.05	2.91	2.44	4.48	4.52	3.01	4.01	37.25	94	66	8
Hamilton.....	4.00	1.91	4.19	2.26	1.92	2.24	3.62	2.25	3.60	2.65	3.12	3.43	35.49	85	48	10
Kincardine.....	4.91	1.80	3.83	2.09	2.48	2.26	3.05	1.99	4.31	3.99	3.42	3.67	37.71	93	63	7
Kingston.....	3.16	2.68	4.22	1.86	1.98	1.84	3.43	1.76	2.76	3.36	3.33	3.30	33.68	119	67	5
Little Current.....	2.39	1.89	1.62	1.55	2.91	2.10	2.83	2.80	3.48	3.71	3.13	2.01	30.22	65	34	7
North Gwillimbury.....	2.79	1.47	3.57	1.67	1.73	2.19	2.04	1.82	2.53	2.62	2.39	2.31	27.13	59	50	10
Ottawa.....	4.10	2.98	3.28	1.79	2.09	1.85	2.01	1.83	3.00	3.00	2.49	3.83	31.70	88	68	5
Parry Sound.....	2.97	1.81	3.65	1.71	3.46	1.78	2.26	3.40	4.23	4.86	3.25	3.06	36.44	112	63	4
Pembroke.....	2.47	1.62	2.49	1.78	2.95	2.76	3.65	3.07	4.56	4.04	3.32	2.56	35.27	82	52	7
Peterborough.....	2.42	2.00	2.77	2.13	2.18	2.03	3.73	2.10	3.31	2.56	2.08	2.26	28.57	80	56	10
Point Clark.....	3.93	2.19	3.10	2.47	3.23	2.56	2.72	2.18	2.39	4.01	3.71	3.27	36.16	109	78	8
Port Dalhousie.....	2.47	1.71	4.23	2.58	2.35	1.47	3.10	1.81	3.00	2.11	2.39	2.11	29.33	106	37	4
Port Dover.....	2.82	2.59	3.60	1.98	2.01	1.64	3.61	2.81	2.72	3.03	2.79	2.59	32.18	110	42	5
Port Stanley.....	3.12	3.05	3.93	2.49	2.46	1.84	4.11	2.91	2.89	3.35	2.70	2.32	35.17	122	53	5
Sauguen.....	3.46	1.58	3.69	1.86	2.42	2.24	2.15	1.80	3.58	4.10	3.37	2.60	32.25	110	50	5
Simcoe.....	3.61	1.99	4.04	2.35	2.46	2.70	3.65	3.73	2.85	2.99	3.21	3.64	36.43	84	29	9
Stratford.....	3.65	2.09	3.80	2.58	3.04	2.47	3.26	3.17	3.49	3.64	3.23	3.71	38.13	90	64	10
Toronto.....	2.90	2.67	3.00	2.71	3.69	2.73	3.20	3.67	3.67	2.53	3.31	3.05	35.83	110	64	39
Windsor.....	3.33	1.93	3.04	1.92	2.40	2.84	2.84	2.40	1.69	1.95	2.67	2.77	29.78	82	34	10
Woodstock.....	2.97	2.06	3.68	2.32	2.46	2.58	3.61	3.28	2.92	3.34	2.68	3.17	35.07	110	70	9

The large black figures represent the highest, and the figures in italics the lowest numbers in each column.

THE MAP.

The accompanying map illustrates as definitely as possible, with the data at command, its annual distribution throughout the Province. [*See map attached to evidence.*]

INADEQUATE MATERIALS.

The results scarcely repay the amount of work and care necessary for their production unless indeed, they serve to show how utterly inadequate are the data obtainable, to enable anyone to point out the peculiar features of any special locality. While the map illustrates very broadly the districts where the fall of rain and snow is above, or below, the average for the whole Province, there might be places within the districts marked where the results would differ so much from those shown, as to alter the average for the whole district. It is almost impossible to construct a scientifically accurate hyetological map of Ontario with such meagre information. Instead of 30 places at which observations are taken, we should find 300, or perhaps 3,000 nearer the number required. At present we have to draw too much upon imagination, and our knowledge of the topographical features of the country to fill in the blanks.

DIFFERENCES IN REPORTS.

As an illustration of the difficulty of deducing information which would prove of value, from the data obtained, I have given the total precipitation at the lighthouse, as well as at the high school, at Goderich. It will be seen that there is a difference of over 8 inches per annum. This result varies but little if we take the same period for each station. It would appear that about one half of this is made up in rain and the other half in snow, more than 3 feet more of snowfall being recorded at the lighthouse than at the high school. There is not very much difference in the number of days of rain and snow at these places.

DAYS OF RAIN AND SNOW.

The number of days of rain and snow are given in the table, but the figures are not strictly comparable, as, indeed, appears evident upon inspection. The reason for this is, that at some places it is called a rainy day when rain falls, but the amount is insufficient to be measurable, at other places no notice is taken of such small amounts of rain. The "instructions to observers," issued in 1878 will probably alter this in future.

WANT OF MORE COMPLETE INFORMATION.

It was my intention to have sent you maps showing the distribution of the rainfall for each month, but I found, after constructing them, that they would probably mislead those who saw them. I had also intended to have prepared maps showing the variations in temperature, or, rather, the average number of days when the highest, the lowest, and the mean temperature, was above or below certain points during each month; but after considerable labour it was found that, for the reasons given above, the results would be of little value.

COMPARISON OF MEAN TEMPERATURES.

It is obviously misleading to compare the mere annual, or even the mean monthly, temperature of one place with another, because the extent of the variations during the month or year could not be shown; and while at one place, or in one district, there might be little change during any period, and the mean temperature of that period be below that of another place, in the latter we might have extremes of heat and cold, which would give a higher mean for the same period.

[*Mr. Monk.*]

A MORE THOROUGH SYSTEM NEEDED.

The result, therefore, of the investigation shows unmistakably that if we wish to have anything approaching an accurate knowledge of the climate of Ontario, something must be done to encourage the taking of observations of the weather throughout the Province. It is almost useless, for any scientific or useful purpose, to attempt to compare our climate with that of other countries under present circumstances. A strong effort should therefore be made to place us upon a better footing in this respect.

Yours respectfully,

THOMAS H. MONK.

Sitting to take oral evidence, held at Toronto, October 26, 1880. *Present*—Messrs. JOHN DRYDEN, M.P.P., (Chairman), E. BYRNE, W. BROWN, F. MALCOLM, A. WILSON, T. STOCK, W. WHITELAW and A. H. DYMOND.

“MOSES OATES” EVIDENCE.

JAMES GORDON MOWAT was called and examined.

To Mr. Dymond.—I am a weather prophet, and, as such, am known as “Moses Oates.” I have given considerable attention to meteorology for about fourteen years, and am an observer of the meteorological service at Galt. My attention has been chiefly directed to the temperature of various districts, variation of temperature, rainfall, snowfall, and the causes of these. There is no peculiarity in the Ontario climate, except that there is not the same difference here between high and low lands with respect to rainfall that there is in Europe, where high lands, as a rule, have a much greater rainfall than low lands.

FRUIT GROWING DISTRICTS.

In fruit growing countries sunshine and rainfall have a greater effect upon the quality of fruit than the mean temperature of the year. The vine flourishes best where there is a great deal of sunshine, and where the rainfall is not great during the season of vegetation. Moisture, combined with heat, is injurious to the grape. I am not aware what is the difference with respect to other fruits between a rainy and a sunshiny district, although I have no doubt there is a difference. The peach and the grape are cultivated largely in the Niagara District, on account of its high temperature and comparative exemption from low extremes. That district is generally from three to four degrees warmer than the north shore of Lake Ontario in the neighbourhood of Toronto, and frequently in the middle of the day, is ten or fifteen degrees warmer. This is partly owing to the fact that there the south-west wind passes over land, while the south-west wind coming to Toronto passes over the cooler surface of Lake Ontario. The country between Lake St. Clair and Lake Erie is, in my opinion, superior in many respects to the Niagara District for the production of wine, owing to its smaller rainfall and greater heat, its warmer springs and longer season of vegetation. Many parts of the shores of Lake Huron are also very suitable for fruit culture. The extremes of temperature are fewer there than in either the neighbourhood of Windsor or in the Niagara peninsula. There are instances found in the meteorological reports in which the thermometer has descended to over ten degrees below zero in Hamilton, when in the Huron district it was not below zero. There is a difference of at least two degrees in autumn in favour of Goderich over Toronto, although there is very little difference in the latitude. At Kincardine the mercury very rarely falls below zero.

[*Mr. Mowat.*]

THE EFFECT OF SWAMPY LANDS.

Swampy lands affect the temperature very much. Dundas, for instance, is under the influence of two peculiarities affecting temperature. It is in a deep valley, and the cold air from the surrounding plateau rushes into it, but possibly a more important factor in producing its low temperature is a swamp in its neighborhood, causing in the one year for which I have a comparison, two degrees lower temperature than the annual mean of Hamilton. Stratford has also swamp, and it is slightly lower in temperature than it would be in normal conditions. Newmarket has a large swamp in its vicinity which produces an abnormal deficiency in heat. Its distance from Toronto is about the same as that of Brampton, and its height above the sea certainly no greater, yet while the latter averages only a fraction of a degree lower than Toronto, Newmarket's temperature is two or three degrees lower. Newmarket shows a lower summer temperature than almost any other station in Ontario, and this is owing to the large swamp in its neighbourhood. The following figures for 1876 will illustrate the peculiar temperature of Newmarket :

MEAN TEMPERATURE 1876.

	APRIL.	MAY.	JUNE.	JULY.	AUGUST.	SEPT.	OCTOBER.
Toronto	38°.2	51°.5	65°.5	68°.8	70°.2	57°.5	42°.8
Newmarket.....	35.8	50.9	63.9	68.1	68.4	55.9	41.1
Brampton	37.3	52.7	69.3	70.8	72.2	56.1	42.6

LOWEST TEMPERATURES, 1876.

Toronto ...	17°.0	30°.4	44°.2	46°.2	45°.0	38°.5	23°.0
Newmarket ..	-1.0	25.2	42.0	37.2	34.0	32.0	15.4
Brampton	12.0	33.0	51.0	54.0	52.0	41.0	24.0

To Mr. Byrne.—The water in swamps being very shallow, it heats very quickly and evaporates very rapidly, and thus produces coolness. Deep water has not that effect. Of course swampy lands are more liable to be affected by early and late frosts than drained lands. I attribute the extraordinary prevalence of summer frosts in the neighbourhood of Newmarket entirely to the swamps, which chill the atmosphere for miles around.

The report for 1878, the latest issued, shows a greater difference in the mean temperature of Newmarket, as compared with either Toronto or Brampton, than the figures above given. Other places in the neighbourhood of swamps might also be cited, to show the great effect of wet lands in reducing the temperature.

To Mr. Dymond.—The fitfulness of frosts is due to the varying character of the soil, and its vegetation, the presence of even slight hills or hollows, the nearness to or distance from forests or swamps, etc. A district bordering on a large body of water like a lake is often exempt from frosts to which interior districts are liable. I don't think small lakes two or three miles in length have nearly so much effect in ameliorating the climate, owing

[*Mr. Mowat.*]

to their shallowness. In North Gwillimbury, which lies on Lake Simcoe, the minimum temperature of some months of summer is generally very high—often as high as 55 or 60, when Windsor is only 45 or 50 deg. Very much depends on purely local causes, as the character of the soil, depressions or ridges of land, matters which should be studied by agriculturists.

EUROPEAN COMPARISONS.

The climate of Ontario—the south-western part—corresponds very closely, not with Norway, Sweden, or Russia, as has been represented, but with Roumania. Roumania is more its counterpart, both as regards summer and winter heat, than any other country in Europe. The mean temperature along a line drawn from the Danube through Bucharest to Moscow corresponds very closely at all seasons with the climate of Ontario on a line drawn from Windsor to Pembroke on the Ottawa; Pembroke, however, having a warmer summer than Moscow. Hungary, again, has a climate corresponding in its mean temperature to the south-western part of Ontario, known as the Lake Erie and Niagara District, and produces some of the finest wines in the world—wines that rival the very best wines of France. There are very few stations, out of 200 or more, the reports of which I have looked over, in Germany and Austria, which show a higher temperature in summer than some parts of the Province of Ontario. Many parts of Northern Italy, at similar elevations to Ontario stations, show a temperature in midwinter only six or seven degrees higher than Southern Ontario, and a summer temperature very nearly the same. The growth of the vine is very successful in all the countries I have named—Roumania, Bulgaria, Southern Russia, Hungary, and northern Italy, and so far as climatic conditions are concerned, there is no reason why southern Ontario should not rival the best wine districts in the world, in many classes of wines. We have a longer duration of summer temperature than most parts of the Rhine. Windsor has had a temperature during the five years, 1874 to 1878, inclusive, of 63½ deg. in September, and 73 deg. in July, the heat of which latter month at Windsor is very little lower than its temperature at Oran in Africa, at Marseilles in the south of France, and only a few degrees lower than at Jerusalem and several other places in Syria.

To Mr. Brown.—For at least three decades after 1841, the average snowfall steadily increased, and the number of days on which snow fell also greatly increased. The average depth of snow on the ground at one time has, I think, been diminished. The rainfall in the second or third quarters of the year decreased till 1871, but lately, I think, the rainfall in this part of Ontario has been increasing in those quarters—that is, during the last six or seven years. The causes of this increase are probably not due to anything peculiar to the Province, but have their origin outside of the earth. A peculiarity of the Province in the distribution of its precipitation is that the district east of Lake Huron and north of the Grand Trunk Railway shows a snowfall very much greater than the country lying south of the Grand Trunk. For instance, Windsor in 1879 shows a snowfall in January of five and a half inches, Kincardine of forty and a half inches, and Owen Sound of forty-three inches. The total snowfall at Windsor, in that year, was thirty-two inches, while at Kincardine it was 154 inches, and at Owen Sound 159 inches. What falls as rain over South-Western Ontario often falls as snow over these high lands. Parry Sound is not affected so largely in the same way. The explanation of the difference I have mentioned is that the westerly winds passing over Lake Huron take up a large amount of moisture, which, coming in contact with the colder land east of Lake Huron, is condensed into snow, and occasionally the north-west winds in that section of country bring a fall of six or eight inches of snow, while south, in the neighbourhood of Galt and Brantford, no snow whatever falls. I think meteorology can be made useful to agriculture by the temporary establishment of a number of stations, especially near swamps, on high and low levels close to each other, and on different soils. Farmers could keep records themselves, and give the results of their observations on the effects of different soil and altitudes to the public. With respect to forecasting the weather, I am of opinion that before many years, the weather bureaux will be able to forecast the leading features

[*Mr. Mowat.*]

of the coming seasons almost as accurately as they now do the weather twenty-four hours in advance, and thus be of great service to the agriculturist. The effect upon temperature of the clearing of forests is generally thought to be an increase of extremes of temperatures and a decrease of rainfall. In the north of Italy at one time the forests were cut down over large districts, and the result was that maize could not be grown successfully, owing both to the decrease of the rainfall and the greater extremes of temperature; but when the trees were replanted, the cultivation of maize was again successfully prosecuted.

To Mr. Malcolm.—The clearing of forests does not prevent frosts so much as the draining of swamps and marshy lands. Drainage is the real secret of improving the temperature of a district. I believe the draining of a swamp will moderate the climate for many miles around it.

J. G. MOWAT.

